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THE RELATIONSHIP OF CHRONIC LESIONS TO CARCINOMA OF THE COLON—CHRONIC ULCERATIVE COLITIS

Collective Review

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DURING the past decade the results of surgical management of carcinoma of the large bowel have improved dramatically, and the application of technical advances has greatly reduced the hazards which too often followed resections of the colon. Now that malignant lesions of the colon, in expert hands, can be treated in such a manner as to offer a more favorable prognosis to the patient, it is our duty to improve the clinical results further through efforts directed at earlier recognition of the cancer. As a step toward this objective we may learn some facts from a careful analysis of our knowledge regarding those diseases of the colon that may have a prefatory relationship to colonic cancer, one being chronic ulcerative colitis.

In order that the extent of this review may be kept within bounds, the literature of the last ten years only has been surveyed; references to earlier studies have been made only when necessary and when the reason for their citation is evident.

At the outset it may be stated that, although a number of reviews have appeared (7, 8, 11, 14, 16, 19, 21, 27, 30, 39, 61) during the past decade, our knowledge in this field has not been greatly extended either by the addition of new material or by significant fundamental discoveries.

A review of the recent literature on chronic ulcerative colitis demonstrates the controversial status of all aspects of the subject. In 1939 Willard (62) wrote of chronic ulcerative colitis: "If the two recognized entities, tuberculous colitis and amebiasis, be omitted from discussion, there is no agreement as to classification, etiology, natural history, prognosis, or treatment of this symptom complex." Six years later, in 1945, Willard's statement is certainly just as valid as it was when first made. There are a number of theories regarding the cause of this disease and the authors are proponents of the several ideas; these have been summarized in Table I.

The data assembled in this table present convincing evidence of the meagerness of our knowledge regarding the exact etiology of chronic ulcerative colitis. Notwithstanding the fact that, even during recent years, many students have carried on extensive investigations of the problem there is still no unanimity of opinion. Possibly this is true because in the past all of the chronic ulcerative diseases of the large bowel, except those due to tuberculosis, amebiasis, and carcinoma, have been grouped comprehensively together under the term, chronic ulcerative colitis. However, the present tendency is in the opposite direction, and, as a result of more experience, there is an inclination to define the disease entities within the composite group more precisely. Thus in 1941 Bargen (7) pointed out that "chronic ulcerative colitis as it is known today is probably a syndrome consisting of numerous disease entities." Apparently the resolution of this phase of the general problem is still progressing in the same direction, because, more recently, in 1944 Bargen (8) states, "There are many varieties of ulcerative enterocolitis. One cannot emphasize too strongly the importance of establishing as nearly as possible the nature and cause of a given case." He now recognizes the following seven disease conditions that are characterized by varying degrees and types of chronic ulceration of the colon:

1. Streptococcal ulcerative colitis (also referred to as "nonspecific" or "idiopathic ulcerative colitis", and sometimes as "colitis gravis" and "thromboulcerative colitis")

TABLE I.—THEORIES ON THE ETIOLOGY OF CHRONIC ULCERATIVE COLITIS

General Type of Etiology	Particular Causative Agent or Factor	Author Proponent
Allergic	Food antigens	Andresen, '38
Endocrine	Endocrine imbalance	Portis, '35; Kopelowitz, '38; Reed, '39
Hereditary (?)	Familial occurrence	Jackman and Bargen, '42
Infectious	Diplostreptococcus	Bargen, '24 and '27; Graham, '38; Feder, '39
	Streptococcus	Cartwright, '38; Chopra and Ray, '39; Bargen, '44
	Bacillus necrophorus	Dack et al, '39; Dragstedt et al, '41
	Bacillus dysenteriae	Hurst, '21; Hern, '31; Penner, '36; Turner, '36; Winkelstein, '37; Felsen, '39
	Endameba histolytica	Fradkin, '37; Winkelstein, '37
	Virus	Gallart and Domingo, '35
	Secondary infection	Paulson, '38; Winkelstein and Shwartzman, 42; Bockus, '44
Muscular	Muscle spasm	Lium, '39; Lium and Porter, '39
Nervous	Psychogenic stimuli	Murray, '30; Rechad, '36; Sullivan, '36; Wittkower, '38; Reed, '39; Daniels, '42
Nutritional	Vitamin or calcium deficiency	Kopelowitz, '38
Terminal State	Spastic colon	Kuttner, '26; Drueck, '29
	Mucous colitis	Evans, '34

2. Amebic ulcerative colitis
3. Ulcerative colitis due to the virus of venereal lymphogramuloma
4. Regional ulcerative colitis (cause not clear)
5. Regional ileitis
6. Tuberculous ileocolitis
7. Other intestinal conditions
   (a) Chronic bacillary dysentery
   (b) Ulcerative colitis of unknown cause
   (c) A deficiency syndrome
   (d) Allergic colitis

In the study of the relationship of this syndrome to carcinoma of the colon, information regarding the etiology of chronic ulcerative colitis has a double interest. First of all, since most previous reports in the literature have not clearly differentiated particular disease entities and since a number of etiological agents and factors appear to be involved, it is unlikely that, from an analysis of recorded data, we should discover a kinship of cause for the carcinoma and for the pre-existing ulcerative state. In the second place, if carcinoma is an important complication of chronic ulceration in the colon, the existing data can scarcely be expected to establish more than a sequential relationship of the carcinoma to the prefatory chronic ulceration. Pertinent observations in the literature have been assembled in Table II.

In 1927 Yeomans (67) reported the development of a rectal carcinoma in a woman with chronic ulcerative colitis and from whose bowel he had previously removed several benign adenomas. This case was 1 of 7 that Yeomans presented to demonstrate his concept of the precancerous nature of adenomatous tumors of the colon; he stated: "Both clinically and by histological study of the specimens, the transition from simple inflammatory hyperplasia to tumors pathologically cancerous can be traced through stages of inflammation, gland cell hypertrophy and hyperplasia, and adenoma to definite adenocarcinoma. It is a logical inference that continuance of the irritative factors that induce the adenomas stimulate epithelial hyperplasia until it breaks through normal bounds and becomes malignant." A year later, in 1928, Bargen (4) reached the same conclusion and wrote: "In view of the various reports in the literature, the frequency with which polyposis has occurred in the series of cases of chronic ulcerative colitis at the Mayo Clinic, and the simultaneous occurrence of polyp and carcinoma in the diseased colon, the following hypothesis is offered: the sequence of events in some cases of malignant disease of the colon is chronic ulcerative colitis, multiple polyposis, and malignant disease." Since then Bargen and Comfort (9); Burst and Bargen (15); Bargen and Dixon (10); Bargen, Jackman, and Kerr (11); Streicker (56); Matzner and Schaefer (44); Rankin (51); Jackman, Bargen, and Helmholz (37); Sauer and Bargen (55); Cattell (17); and others have subscribed to this thesis as it was originally stated by Yeomans and later by Bargen.

The observations and conclusions of other authors, however, have supported an opposing view. In 1934 Ewing (26) stated, "It is somewhat

remarkable that carcinoma very rarely develops in chronic ulcerative proctitis or colitis." In 1939 Swinton and Warren (59), basing their conclusions upon extensive material, wrote: "It is possible in our series to demonstrate histologically all stages in the sequence of change from normal colonic mucosa to actual adenocarcinoma. . . . . From a microscopic study of a large series of intestines from patients with chronic ulcerative colitis, both specimens removed surgically at varying lengths of time after onset of the disease and specimens obtained at autopsy, we believe that chronic ulcerative colitis is not a factor predisposing to the development of polyps. . . . . In our patients with ulcerative colitis we have observed another interesting fact. Following healing of the acute ulcerative process, we have known these pseudopolypoid tumors to regress and disappear. . . . . We have never observed the regression or disappearance of true polyps of the large bowel except in rare instances in which the polyp has broken away from its pedicle. This, of course, also definitely suggests that the pseudopolypoid tumors resulting from known irritation and infection have different fundamental growth characteristics than the discrete and multiple polyps which are not the result of known infectious processes. . . . We have never observed the polypoid changes seen in ulcerative colitis progress to a malignant stage." Moreover, Hurst (34) in 1935, Willard with his associates in 1938 (63), and Feder (27) in 1939 have reported on series of cases comprising, respectively, 40, 66, and 88 patients with chronic ulcerative colitis, with no carcinomatous change.

With the foregoing general summary of the conflicting opinions the data arranged in Table II may be analyzed.

During the last twenty years, and apparently because of the continuing interest of Bargen, numerous papers on this subject have appeared in which the accumulating material from the Mayo Clinic has been utilized. Bargen's name is associated with the majority of these reports. An attempt has been made in Tables II and III, to congregate the findings recorded in these papers, and, in order to extract the data essential to this study, the successive reports have been compared. It is unfortunate that individual reports were not regularly included so that the cases could be accurately identified.

The data presented in Table II may be rearranged and summarized in three categories:

1. The literature contains the reports of 33 individual cases of chronic ulcerative colitis in which carcinoma of the colon developed as a complication. Of these 33 cases, 4 were reported as isolated cases and 29 were reported as individual cases belonging to groups of cases with colitis.

2. Observations on the associated incidence of carcinoma of the colon and chronic ulcerative colitis have been recorded in 7 series of cases and in each the percentage of cases with carcinoma has been calculated. When these groups are combined it appears that 28 patients among a total of 1,467 cases of chronic ulcerative colitis developed carcinoma. On the average, therefore, the incidence is 1.9 per cent, and the percentage for each of the four series in which it could be calculated separately was 1.3, 1.6, 2.16, and 3.2, respectively. In 3 other series, made up of 40, 66, and 88 cases, respectively, no case of carcinoma was observed. In 1940 Jackman, Bargen and Helmholz (37) studied a group of 95 children in whom 6 carcinomas developed later in life; this was an incidence of 6.3 per cent among those who suffered from colitis as children. A summary of these records is presented in Table III.

3. In 1944, Cattell (17) and Sauer and Bargen (55) reported on groups of 11 and 26 cases, respectively, in which carcinoma of the colon developed as a complication of chronic ulcerative colitis; in their papers, which together report a total of 37 observations, no individual case records were included nor was there a record of the total number of patients with colitis among whom these cases of carcinoma appeared.

The matter of carcinomatous transformation of adenomatous polyps in the colon, and particularly the relation of chronic ulcerative states to that problem and to an increased incidence of carcinoma are of practical and theoretical interest. From the clinical point of view the natural history of a disease must be charted before the value of therapeutic measures can be estimated. From the standpoint of cancer control it is essential that cognizance be taken of all predisposing influences. Furthermore the pure scientist has an interest in any evidence which may be garnered to demonstrate a relationship between chronic irritative processes and the malignant state.

General incidence. Critical analysis of the accumulating data appears to fortify the hypothesis enunciated by Yeomans and by Bargen that there is an increased incidence of colonic carcinoma in chronic ulcerative colitis. Recently Cattell (17) wrote: "For a number of years our observation indicated that malignancy was a rare development on the basis of chronic ulcerative colitis. However, in the last two years we have observed 8 patients with carcinoma arising in ulcerative colitis, and previous to this period, 3 additional patients had been seen. At present we believe

TABLE II.—PUBLISHED REPORTS OF CARCINOMA OF THE COLON WHICH DEVELOPED IN PATIENTS HAVING CHRONIC ULCERATIVE COLITIS

Serial Number	Year of publication	Author	Sex of Patient	Age of Patient when Carcinoma was Recognized	Duration of Colitis in Years Prior to the Development of Carcinoma	Number of Cases of Colitis Studied and Reported	Reported Individually	Number of Cases of Carcinoma by Histological Examination	Reported as a Group	Per Cent of Cases with Carcinoma	Location of the Carcinoma
1	1927	Yeomans	F	33	17		1				Rectum
2	1928	Bargen (a)							(14)		
3	1928	Bargen (b)	M	(21)	(13)		(1)				(Rectum)
4	1928	Bargen (b)	M	(26)	(10)		(1)				(Multiple)
5	1928	Bargen (b)	M	(51)	(14)		(1)				(Rectum)
6	1928	Bargen (b)	M	(30)	(20)		(1)				(Transverse Colon)
7	1928	Bargen (c)	M	(45)	(6)						(Cecum)
8	1929	Bargen (d)				(693)			(15)	2.16	
9	1935	Hurst (e)				40			0	—	
10	1935	Hurst (f)					1				
11	1935	Hurst (f)	F	50			1				Rectum
12	1935	Hurst (f)	M	42	10		1				
13	1935	Bargen and Dixon (g)		21	15		1				Rectum
14	1935	Bargen and Dixon (g)		21	12		1				Cecum
15	1935	Bargen and Dixon (g)		26	10		1				Entire Colon
16	1935	Bargen and Dixon (g)	M	30	8		1				Rectum
17	1935	Bargen and Dixon (g)		32	8		1				Cecum
18	1935	Bargen and Dixon (g)		28	20		1				Transverse Colon
19	1935	Bargen and Dixon (g)		35	16		1				Rectum and Cecum
20	1935	Bargen and Dixon (g)		43	25		1				Sigmoid and Splenic Flex.
21	1935	Bargen and Dixon (g)		50	27		1				Multiple in Rectum
22	1935	Bargen and Dixon (g)		47	18		1				Transverse Colon
23	1935	Bargen and Dixon (g)		38	19		1				Splenic Flex. and Desc. Colon
24	1935	Bargen and Dixon (g)		56	26		1				?
25	1935	Bargen and Dixon (g)		43	2		1				Transverse Colon
26	1935	Bargen and Dixon (g)		60	¾		1				Sigmoid
27	1935	Bargen and Dixon (g)		57	1		1				Hepatic Flexure
28	1935	Bargen and Dixon (g)		63	1½		1				Cecum
29	1935	Bargen and Dixon (g)		55	¾		1				Descending Colon
30	1935	Bargen and Dixon (g)		69	1¾		1				Hepatic Flexure
31	1935	Bargen and Dixon (g)		60	1½		1				Rectum
32	1935	Bargen and Dixon (g)		45	7		1				Multiple
33	1935	Bargen and Dixon (g)		40	2		1				Cecum
34	1935	Bargen and Dixon (g)		45	11		1				Multiple
35	1935	Bargen and Dixon (g)		65	35		1				Sigmoid
36	1935	Bargen and Dixon (g)		40	10		1				Rectum
37	1935	Bargen and Dixon (g)		34	9		1				Rectum

TABLE II.—PUBLISHED REPORTS OF CARCINOMA OF THE COLON WHICH DEVELOPED IN PATIENTS HAVING CHRONIC ULCERATIVE COLITIS—Continued

Serial Number	Year of Publication	Author	Sex of Patient	Age of Patient when Carcinoma was Recognized	Duration of Colitis in Years Prior to the Development of Carcinoma	Number of Cases of Colitis Studied and Reported	Reported Individually	Number of Cases of Carcinoma by Histological Examination	Reported as a Group	Per Cent of Cases with Carcinoma	Location of the Carcinoma
38	1935	Bargen and Dixon (g)		46	*6*		1				Cecum
39	1935	Bargen and Dixon (g)	F	57	*11*		1				Rectum
40	1936	Chapuy					1				Rectum
41	1938	Bargen, Jackman and Kerr (h)				871			(*28*)	3.2	
42	1938	Feder (i)				88			0	—	
43	1938	Streicker (j)				217			3	1.3	
44	1939	Willard *et al.* (k)				66			0	—	
45	1939	Matzner and Schaefer (1)	M	29		(7)	1				Sigmoid
46	1939	Matzner and Schaefer (1)				185			3	1.6	
47	1940	Jackman, Bargen and Helmholz (m)				(95)			(6)	6.3	
48	1944	Cattell (n)							11		
49	1944	Sauer and Bargen							26		
		Total (o)				1467	33		(71)		

Explanatory Notes for Table II: The numerals enclosed in parentheses indicate that the particular figures were not used in the totals. Italicized numerals were derived by calculation from published data.

(a) Two cases of lymphosarcoma and 1 case of lymphatic leucemia and 3 cases in which the diagnosis depended upon "proctologic or roentgenologic evidence" (4) have been excluded.

(b) Individual case reports included in the group of 14 cases listed under Serial No. 2. Although the data is insufficient to permit accurate recognition, we believe that this case is included among those corresponding to our Serial Nos. 13 to 39.

(c) An individual case report included in Bargen's paper of 1928. This was a case of lymphosarcoma (not a carcinoma); it was excluded from the group of 14 cases listed under Serial No. 2; this case is tabulated to emphasize our effort to include only cases of proved carcinoma.

(d) Apparently an additional case reported by Bargen (5) since the paper of 1928 (4).

(e) Cases reported from the New Lodge Clinic.

(f) Case not included in group of 40 reported from the New Lodge Clinic and listed under Serial No. 9.

(g) One of a group of 27 cases in which "25 cases of carcinoma and 2 of lymphosarcoma" (4) were reported; from the report the 2 cases of lymphosarcoma cannot be identified.

(h) "In the years 1925 to 1931, inclusive," 871 patients with chronic ulcerative colitis were seen at the Mayo Clinic. Since it is believed that the 6 cases referred to in (a) above may have been included among the 28 carcinomas this latter figure should be reduced to 22 and the percentage from 3.2 to 2.5. Sauer and Bargen (54) say 7 additional cases are recorded in this paper.

(i) From Beth-El Hospital, Brooklyn, N. Y.

(j) From the Research and Educational Hospitals, University of Illinois, and the Grant Hospital, Chicago.

(k) From the Department of Gastroenterology; Graduate School of Medicine, University of Pennsylvania, Philadelphia.

(l) From the Jewish Hospital of Brooklyn, New York—7 cases of polyposis.

(m) Included with cases shown under Serial No. 41.

(n) From the Lahey Clinic.

(o) Apparently the gross total of 71 should be reduced by the subtraction of 6 as explained in (h) to make a total of 65.

that malignancy, while somewhat rare, is most frequent in patients who have had ulcerative colitis for over five years. We have been following patients carefully for these last fifteen years, and in those who have had symptoms for a long time an increasing incidence of carcinoma has been noted." This statement is especially important for, since it is based upon further experience at the Lahey Clinic, it may be thought to alter somewhat the force of the negative expression made by Swinton and Warren at an earlier date (quotation on p. 656).

As has been pointed out, the average incidence of carcinoma as calculated in the reported series of cases of chronic ulcerative colitis is 1.9 per cent. Statistically, this figure would require the sam-

TABLE III.—PUBLISHED REPORTS ON THE OCCURRENCE OF CARCINOMA IN GROUPS OF PATIENTS HAVING CHRONIC ULCERATIVE COLITIS

Author	Number of cases of Chronic Ulcerative Colitis Studied as a Group for the Incidence of Carcinoma of the Colon		Number of Carcinomas of the Colon Observed in Groups of Cases of Chronic Ulcerative Colitis		Number of Carcinomas in Per Cent
	Net Total	Gross Total	Net Total	Gross Total	
Mayo Clinic: Bargen, '29	693	693	15	15	2.16
Bargen, Jackman & Kerr, '38	178	871	7	(28)	3.2
Jackman, Bargen & Helmholz, '40	0	95	0	6	6.3
Hurst, '35	40	40	0	0	—
Feder, '38	88	88	0	0	—
Streicker, '38	217	217	3	3	1.3
Willard et al '38	66	66	0	0	—
Matzner & Schaefer, '39	185	185	3	3	1.6
Total	1467		28		

pling of approximately 100 cases before a negative finding could be interpreted as having significance. It is interesting to note (Tables II and III) that the only published series in which no carcinoma was found are those numbering less than 100 (40, 66, and 88) cases. On the other hand, in each of the larger series (185, 217, and 871, respectively) carcinomas were observed. Granting the statistical validity of this assumption, calculation of the incidence with the inclusion of the three smaller series of less than 100 cases may have produced an abnormally low average figure; on this basis it seems likely, therefore, that a figure of slightly more than 2 per cent may, on the average, express the incidence of association for these two diseases.

Sex incidence. Of the 11 cases in which the sex of the patient was recorded, 8 occurred in males and 3 in females. These are too small numbers to have intrinsic significance. More data on this point are needed; they are needed to aid in determining whether or not there may be a deviation in the incidence of carcinoma in patients with colitis from that in persons not so afflicted.

Age incidence. In 31 instances we have a record of the patient's age at the time when the carcinoma was discovered (Table IV). With these few figures the distribution according to age is shown in Table IV. Here again more recorded observations will be important.

In this connection attention needs to be called to one contribution of the greatest importance. Jackman, Bargen and Helmholz (37) reported a group of 95 patients who were less than sixteen years of age at the time of the onset of symptoms of chronic ulcerative colitis. As may be seen from Tables II and III, 6 of these children later (after childhood) developed carcinomas, an incidence of 6.3 per cent. Jackman and his associates pointed out that, although carcinoma of the large bowel was found in 3.2 per cent of their entire group of 871 patients, when this group of 95 (in which the symptoms of colitis had appeared during childhood) was studied separately, carcinoma appeared nearly twice as frequently (6.3 per cent). Indeed, as these authors state: "In general, the only significant difference in complications between the two groups is the relatively high incidence of carcinoma of the colon among children."

Again it is unfortunate that more data on each member of this juvenile group were not recorded. It would be most instructive to know in each case the interval between the onset of the colitic symptoms and the discovery of the malignant change. In this group of 95 children, colitis began in each year of life, with greater incidence in each of the years from ten to sixteen, inclusive. Were the 6 who developed carcinoma among those of the 95 in whom the colitis began in their early years, or were they from among those in whom this condition began in the later period? Were these 6 children those who accounted for all of the cases that became malignant during the third decade (Table IV)? Can it be that the 1 case of lymphatic leucemia and the 2 cases of lymphosarcoma (so much more common in early life than is carcinoma) mentioned in the report by Bargen and Dixon (10) were among these 95 children? If so, 2, or possibly 3, cases would need to be subtracted from the 6.

The duration of the colitis in years prior to the development of carcinoma is recorded for 29 cases and ranged from three fourths of a year in 2 cases to thirty-six years in 1 case of great chronicity.

The segmental location of the carcinoma within the large intestine is recorded for 29 patients: in 9 cases the carcinoma was in the rectum; in 5, in the cecum; in 3, in the transverse colon; in 2, in the sigmoid; in 2, in the hepatic flexure; in 1 case, in the splenic flexure; and in 1, in the descending colon. In another instance the entire colon was involved. In 5 other cases multiple carcinomas were found: in 1 of these cases the tumors were confined to the rectum; in another, there was a carcinoma in the rectum and one in the cecum; in the third case, carcinomas were found in the

TABLE IV.—DECADE IN WHICH A CARCINOMA OF THE COLON WAS DISCOVERED IN 31 CASES OF CHRONIC ULCERATIVE COLITIS

Years by Decades	0–9	10–19	20–29	30–39	40–49	50–59	60–69	70–79	80–89
Number of Patients	0	0	5	6	9	6	5	0	0

sigmoid and in the splenic flexure; and in 2 cases multiple carcinomas were found but not localized in the description. A greater number of observations are needed to test the significance of the segmental distribution as well as of the occurrence of multiple tumors.

Thus an analysis of the recorded data seems to demonstrate an increased incidence of carcinoma among sufferers from chronic ulcerative colitis. However, before the increased incidence can be finally established the problem should be approached from two other points of view. In the first place, the general hypothesis needs to be critically scrutinized, and, in the second place, the hypothesis can be removed from the realm of argument only when supported by a greater number of observations.

GENERAL CRITICISM OF THE HYPOTHESIS

In chronic ulcerative colitis there is the following sequence of pathological circumstances: long-continued inflammation, extensive damage to the bowel wall, and more or less adequate repair (6). It would not be particularly surprising if such preparation did lead to a malignant change, for in a variety of other conditions much clinical evidence has been assembled in favor of chronic irritation as a cause of cancer (12). It is not necessary to presuppose a "neoplastic factor" (15) peculiar to chronic ulcerative colitis, and it is not to be required that a common cause for the two conditions should be demonstrated.

If chronic destructive lesions of the colon lead to an increased incidence of malignancy, a similar relationship might be expected in groups of cases of amebiasis and tuberculous colitis. Reports on such series would add importance to the literature.

A further study of the relationship of polyposis to carcinoma of the colon is in order and the place of polyps in relation to the carcinomas that develop in cases of chronic ulcerative colitis should be determined. Klemperer (38) has said; "A striking predilection for rectum and sigmoid is not evident for polypi as for carcinoma. More than 75 per cent of the latter are found in these parts of the colon, while only 43 per cent of polypi are found in rectum and sigmoid." Furthermore, the literature contains such contrasting opinions as those of Swinton and Warren (59) and Bargen (6), and in the future, it will be important to distinguish carefully between pseudo- and adenomatous polyps (45, 61).

General mortality statistics of recent date (*Special Report U. S. Bureau of the Census*, 1940) indicate the high frequency of colonic cancer, which accounts for about 11 per cent of all deaths from cancer. For this reason, when dealing with data pertinent to the present problem, an attitude of cautious discrimination must be maintained.

Finally, in the statistical evaluation of evidence for the elucidation of problems in which the mathematical preponderance is not likely to be dramatic, the greatest care must be employed in the scrutiny of individual case reports, in the inspection of sources, and in the critical assemblage of organized data. For example, in the utilization of reports from large and popular clinics, assurance must be available that no factor of selection has entered as the result of a tendency to collect unusual cases; selection of this type, or on any basis, will distort the picture of the natural history of the disease.

THE HYPOTHESIS REQUIRES THE SUPPORT OF MORE OBSERVATIONS

The practical and theoretical importance of the hypothesis which is here considered cannot be denied. Attention is called to the paucity of available reports. In order to refute or to establish the hypothesis, more detailed and more extensive data than has thus far been published are necessary. Probably a statistical study of possibly 5,000 cases of chronic ulcerative colitis will be essential, and it seems likely that data in this amount are now in the records of gastroenterologists and proctologists of this country.

To be of proper value, future reports on groups of cases should regularly record certain information, and individual reports should include the data required for their admission to a series. It would enhance their value if the following eight items were to be found in each case: (1) sex of the patient; (2) age of the patient when carcinoma was recognized; (3) duration of the colitis in years and/or months prior to the development of carcinoma; (4) number of cases of colitis observed among which carcinoma was sought as a complication; (5) diagnosis of carcinoma made by histological examination; (6) evidence of pre-existing polyp (inflammatory pseudopolyp or adenoma-

tous polyp); (7) segmental location of the carcinoma; and (8) special features of the carcinoma (single, multiple, or diffuse).

SUMMARY

1. The literature contains a paucity of reports on the associated incidence of colonic carcinoma in chronic ulcerative colitis. The reports of only 98 cases have been found, in which the diagnosis of the carcinoma was made histologically.

(a). Thirty-three individual case records have been published.

(b). Sixty-five cases have been reported in groups.

2. The literature contains a record of 7 series of cases of chronic ulcerative colitis in which the associated incidence of carcinoma was observed.

(a). Among a total of 1,467 cases of chronic ulcerative colitis, 28 patients developed carcinoma, and the average incidence was 1.9 per cent.

(b). In isolated reported series the incidence was 0, 0, 0, 1.3, 1.6, 2.16, and 3.2 per cent.

(c). A single series of 95 children with chronic ulcerative colitis was studied; 6 carcinomas were found later in life, an incidence of 6.3 per cent among this group.

3. From the practical and theoretical points of view, the hypothesis that there is an increased incidence of carcinoma in chronic ulcerative colitis is an important concept.

(a) Available evidence appears to support the hypothesis.

(b). To finally establish the hypothesis a study based upon more extensive material and more complete data is necessary.

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ABSTRACTS OF CURRENT LITERATURE

SURGERY OF THE HEAD AND NECK

EYE

Berke, R. N.: Resection of the Levator Palpebrae Muscle for Ptosis, with Anatomic Studies. *Arch. Ophth.*, Chic., 1945, 33: 269.

The author discusses resection of the levator palpebrae superioris muscle for the correction of ptosis. He points out that ptosis may be acquired or congenital, unilateral or bilateral, partial or complete, and that there are 3 categories into which surgery for the correction of ptosis may be divided.

In one category the frontalis muscle is utilized, in the second the superior rectus muscle is used, and in the third, the levator palpebrae is resected or advanced. The last procedure is the operation of choice and seems to yield the best results, provided that the levator muscle is not completely paralyzed.

Procedures which utilize the levator muscle of the upper eyelid include the following: tucking or folding of the aponeurosis of the levator muscle (Everbusch); shortening of the levator muscle by excision of a part of the eyelid; and resection of the tendon of the levator muscle through the skin (Wolff, De Lapersonne, Elschnig, Lancaster, Blaskovics, Wheeler).

The advantages of operations on the levator muscle are as follows: (1) negligible postoperative reaction, (2) absence of lagophthalmos, (3) the eyelid moves with the eyeball, (4) the margin of the eyelid is not deformed, (5) a good lid fold results, (6) no elevation of the brow results, (7) no diplopia develops, and (8) the winking reflex is not disturbed.

The disadvantages are that this procedure can be used only when the levator muscle is present and active; undercorrection may result; and lagophthalmos may result if too much tissue is resected. Inadequate correction of ptosis by resection of the levator muscle through the conjunctiva may be attributed to unintentional resection of Muller's muscle instead of the tendon of the levator muscle, resection of an insufficient amount of the levator tendon, pulling out of the sutures, or absence of the levator muscle. The author concludes from his experimental work, that in resection of the levator muscle through the conjunctiva, Muller's muscle and the tendon of the levator muscle are always excised together.

JOSHUA ZUCKERMAN, M.D.

EAR

Baker, E. E.: The Causal Relationship of Lymphoid Tissue about the Eustachian Tubes and Ear Pathology. *Laryngoscope*, 1945, 55: 174.

The author classifies the picture about the eustachial orifice in four types as follows:

Type 1, in which there is no demonstrable lymphoid tissue about the orifice.

Type 2, in which there is a minimal amount of lymphoid tissue demonstrable.

Type 3, in which there is a moderate amount demonstrable.

Type 4, in which there is considerable lymphoid tissue about the orifice; sometimes lymphoid bands are present and the orifice of the tube has been narrowed.

Five cases are reported, all of which were subjected to adenoidectomy with the LaForce adenoidectomy.

JOHN F. DELPH, M.D.

Kinney, C. E.: A Critical Review of the Fenestration Operation; Report of Cases. *Laryngoscope*, 1945, 55: 117.

The essential indications for the fenestration operation include: bilateral progressive hearing impairment, essentially normal tympanic membranes and eustachean tubes, bilateral audiometric air conduction, hearing loss of an average of 40 decibels for the frequencies between 128 and 4,096, and a bilateral audiometric bone-conduction hearing loss of not greater than 25 decibels covering the same frequencies.

Prolonged observations on 32 cases of otosclerosis showed 7 in which the bone-conduction response had been increasingly poor for the frequencies from 1,024 upward, and in these the bone-conduction loss had proved to be progressive. Of the 8 fenestration cases reported 2 were in this group and these 2 failed to demonstrate a satisfactory hearing gain. The author therefore considers that a bone-conduction curve showing a steadily decreasing response from 1,024 upward is a contraindication for operation. An average threshold loss of less than 35 decibels for the 512, 1,024, and 2,038 frequencies for air-conducted sounds is considered the level of practical hearing. Psychologically, however, it is better to speak of the hearing percentage rather than the percentage of hearing loss.

For the recent results in 8 cases fenestrated over six months previously the method of determining the percentage of hearing recommended by the American Medical Association was utilized. On this basis an 80 per cent hearing or better can be considered as an excellent result, or restoration to the practical level. Such a result was obtained in 4 of 8 cases. The result was unsatisfactory in the other 4 cases because of poor preoperative bone conduction in 2, and closure of the fenestrum in 2. According to the criteria outlined by the author, the claims of from 85 to 90 per cent of successful results are unwarranted.

JOHN R. LINDSAY, M.D.

Putney, F. J.: Penicillin in Mastoiditis and Its Complications. *Arch. Otolar.*, Chic., 1945, 41: 247.

Penicillin has been used in the treatment of otological disease at Bushnell General Hospital for two years. Infections of the mastoid and contiguous structures have been readily controlled, provided the causative organisms were sensitive to the drug. Failure, particularly in local use, usually proved to be due to a resistant bacterial strain.

Six cases of thrombosis of the lateral sinuses were treated. Penicillin was given intramuscularly, 25,000 units every three hours, which dose after three days was reduced to 15,000 units. This invariably controlled the spread of infection. Surgical drainage to remove the clot was also necessary.

Four additional cases, including cerebellar abscess, osteomyelitis and epidural abscess, petrositis, and meningitis were also included, and were each controlled by a combination of surgical drainage and penicillin. Sulfonamide therapy had proved inadequate in most of these patients.

The combination of adequate surgical intervention and penicillin is recommended as the most effective means of combating the serious and life-endangering otological complications.

JOHN R. LINDSAY, M.D.

NECK

Alden, A. M.: A Summary of the Findings in 200 Consecutive Operated Cases of Neck Infection of Dental Origin. *South. M. J.*, 1945, 38: 327.

Alden records his experiences in 200 consecutive operative cases of neck infection of dental origin emphasizing the location of the infection.

Location of Infection

Submental	21
Submental and submaxillary	37
Submaxillary	74
Submaxillary and parapharyngeal	29
Parapharyngeal	22
Subparotid	13
Pterygomaxillary	4

The organisms usually encountered are the spirochete of Vincent and the fusiformis bacillus. These cases may be associated with either the streptococcus or the staphylococcus. One hundred and forty-three cases were preceded by some form of dental surgery, whereas in 57 cases no surgical procedure had been done, the neck infection occurring as a direct extension of the dental involvement into the deeper tissues of the neck.

The management of such patients includes immediate hospitalization, and the administration of neoarsphenamine and sulfonamides as indicated. The time of operation is carefully selected. It is advisable, whenever possible, to give the patient the benefit of neoarsphenamine or the sulfonamides before operation.

The type and extent of the incision must depend entirely on the location of the pus. If it is clearly submental without involvement of the adjoining submaxillary fossa, a midline neck incision down to and through the mylohyoid muscle will satisfactorily drain such an accumulation. Occasionally, when the abscess is located immediately under the front of the tongue, it can be drained by an intraoral incision. If the submaxillary fossa or the submaxillary and the parapharyngeal region have been invaded and exposure of this area is indicated, the Mosher T-shaped incision which exposes the submaxillary gland with upward retraction out of its fossa allows adequate exploration of the entire region. Through this exposure, the gloved finger or an artery clamp pushed upward and backward will enter the parapharyngeal space and posterior retraction will expose the vessel sheath containing the carotid and internal jugular vein. This incision has given most satisfactory results.

The case history of the only fatality in the group is presented; the autopsy report revealed a large abscess occupying the right temporal lobe which was probably of several month's standing.

BENJAMIN GOLDMAN, M.D.

Jackson, C. L. and Norris, C. M.: The Surgical Treatment of Cancer of the Larynx. *Laryngoscope*, 1945, 55: 196.

A recent analysis of the end-results in a series of 150 patients with cancer of the larynx treated at the Temple University Hospital, Philadelphia, Pennsylvania, by surgery and irradiation, during the period from 1930 to 1937, inclusive, showed a combined five-year cure rate of 64 per cent. In 80 per cent of 59 determinate cases in which laryngofissure was done, and in 69 per cent of 48 cases in which laryngectomy was done for an intrinsic lesion a five-year cure was obtained. Thus, of the 101 patients with intrinsic lesions who received surgical treatment by either laryngofissure or laryngectomy 80 patients, or about 75 per cent, obtained at least a five-year cure.

Nine patients with extrinsic lesions, upon whom laryngectomy was done, died. During the same period, 34 patients were treated by irradiation with the protracted fractional technique; 22 of them had intrinsic and 12 had extrinsic lesions. Of the intrinsic group 59 per cent presented a five-year cure and of the extrinsic group 25 per cent presented a five-year cure.

The authors emphasize that the most significant and helpful figures are those obtained in clearly defined selected groups of cases by definitely stated and adequately explained methods of treatment.

NOAH D. FABRICANT, M.D.

Cole, W. H., Slaughter, D. P., and Rossiter, L. J.: Potential Dangers of Nontoxic Nodular Goiter. *J. Am. M. Ass.*, 1945, 127: 883.

The authors discuss the dangers of nodular goiter under four headings:

Carcinoma. Of 523 patients with nodular goiter, 38, or 7.2 per cent, had carcinoma of the thyroid. In

33 of these, the carcinoma occurred in nontoxic nodular goiters (22 in solitary nodular and 11 in multinodular goiters), in 4 it occurred in toxic nodular (all multinodular) goiters, and in 1 patient the carcinoma occurred in a toxic diffuse goiter. The average age of the patients with carcinoma was forty-two years. Thirty-seven per cent of the carcinomas were established to have arisen from fetal adenomas and the authors estimate that an equal number had a similar origin, but extensive overgrowth prevented proof of this. Ninety per cent of the carcinomas occurred in women. Since a diagnosis of cancer was made preoperatively in only 21 per cent of the cases (in 21 per cent of the cases the cancer was found at operation and in 58 per cent it was diagnosed in the laboratory after operation), the importance of removing nontoxic nodular goiters is obvious. Radiation, preferably with radon seeds, following excision of the carcinoma resulted in five-year cures in 50 per cent of the cases.

Development of toxicity. In 326 cases of benign toxic nodular goiter studied, the average duration of the nodule before toxicity developed was nine and thirty-seven hundredths years. Symptoms developed insidiously, and were more often found in the older age groups. Although iodine rarely induces toxicity of nontoxic nodules, the authors report one patient who developed severe toxicity while taking iodine, with disappearance of the toxicity on cessation of the iodine.

Local effects of nodular goiter. About 20 per cent of the patients with nodular goiter complain of pressure symptoms, chiefly referable to breathing.

Systemic manifestations. Heart disease is the most serious complication of toxic nodular goiter. Nontoxic nodular goiter is thought not to produce other than pressure symptoms, but the improvement in the health of many patients after removal of supposedly nontoxic nodules convinces the authors that unrecognized toxicity is often present.

The authors conclude that nontoxic nodular goiters should be removed in young people, because of the high incidence of carcinoma and of toxicity in later life. CLINTON H. THIENES, M.D.

Palmer, M. V.: Hyperthyroidism and Thiouracil. *Ann. Int. M.*, 1945, 22: 335.

The author studied a total of 100 cases of hyperthyroidism, some of which had been under thiouracil treatment for as long as eighteen months. All of the patients had a basal metabolic rate of +30 per cent or greater, and 80 per cent were women. Their ages ranged from fourteen to seventy-two years. So far as possible, urinalyses and white blood counts were taken every other day and the usual blood chemical tests were made weekly. There were 2 groups of patients. The first group were on medical management exclusively, and the second group were referred to surgery for one of two reasons: a previous colloid goiter which had become toxic but which failed to diminish in size under thiouracil treatment and had to be removed for cosmetic reasons; and (2) inability of the patients to return for follow-up. Operation was planned when the basal metabolic rate had reached from one-third to one-half the pretreatment level. At operation the glands were much more vascular than glands in patients not subjected to thiouracil treatment, or in patients who had been given iodine preoperatively. Vitamins were given three or four days preoperatively.

Medical management consisted of the administration of thiouracil, 0.1 gm. every three hours for three days, 0.1 gm. every four hours for from three to six days, then 0.5 or 0.4 gm. daily for about three months, following which the maintenance dose was from 0.1 to 0.3 gm. daily.

In 2 of the earlier cases crystalluria appeared. The administration of 0.67 gm. of sodium bicarbonate with each dose of thiouracil was then instituted in all cases, and no further development of crystalluria was exhibited. Ascorbic acid given in daily doses of 100 mgm. with liver extract and multivitamin preparations was thought to aid in counteracting thiouracil depression of the bone marrow. The giving of vitamins did not seem to alter the lowering of the metabolic rate.

Phenobarbital in appropriate doses was given for a period of from two to four weeks. Daily doses of 0.13 gm. of thyroid or from 0.25 to 0.5 mgm. of thyroxin were given to all patients exhibiting exophthalmos at the beginning of treatment; later, they were given to all patients. Thyroxin proved to be of value in preventing transient enlargement of the thyroid gland during the early part of the treatment; it was also of value in controlling pitting edema. Only exceptional cases received iodine.

The results of treatment were as follows:

No case failed to respond to thiouracil. "The higher the initial basal metabolic rate, the more rapid and dramatic was the response." In cases with cardiac decompensation, more thiouracil was required to affect the pulse pressure and to control the other thyrotoxic symptoms. Of the first 22 cases, 9 developed transient leucopenia. Withholding the drug for a minimum of seventy-two hours overcame this effect, and it did not recur on the resumption of thiouracil.

All cases improved subjectively, then objectively. The most rapid decrease in the basal metabolic rate occurred during the first month of treatment; the average initial basal metabolic rate was +70 and at the end of ninety days the rate was +10. Patients treated with thyroid or thyroxin and thiouracil seemed to recover more rapidly, and with fewer side reactions, than patients receiving thiouracil alone.

No patient came to operation except for the reasons mentioned. No case required surgery for strictly medical reasons. Microscopic sections of the thyroid glands treated with thiouracil varied in degree of hyperplasia, and colloids were present in the sections of 12 glands treated with thiouracil and thyroxin. Two glands which were treated with thiouracil and iodine were similar to glands treated with thiouracil alone. CLINTON H. THIENES, M.D.

Leys, D.: Hyperthyroidism Treated with Methyl Thiouracil. *Lancet*, Lond., 1945, 248: 461.

Methyl thiouracil was used in the treatment of 16 patients with hyperthyroidism with good results; no toxic symptoms of importance were observed by the author.

We are ignorant of the cause of Grave's disease. There are few if any cases in which the evidence points to a purely local cause in the thyroid gland itself. Adenoma exists more often without than with hyperthyroidism. Proptosis, myasthenia, and possibly other features occur coincidentally but are dissociated from the symptoms directly attributable to an excess of thyroxine. Treatment, whether by rest alone, by sedation, by partial destruction of the thyroid through surgery or radiation, or with iodine or thiouracil, causes a decrease of the circulating thyroxine. The disease is thereby cured either because the relative thyroxine deficiency produced lasts longer than the cause of overproduction, or because the original cause is itself augmented by the hyperthyroidism and disappears when this is corrected.

The discovery of the action of thiouracil and related compounds on the thyroid gives us the power of regulating thyroid activity with an accuracy quite unsurpassed by other forms of treatment used for hyperthyroidism, and indeed unsurpassed in the whole field of endocrinology. For the present, and until experience has fully determined the optimum conditions of treatment, it is best that these compounds should be used only by the specialist, with full laboratory control. The follow-up is exceedingly important, and should be under the supervision of the specialist also.

CHARLES BARON, M.D.

McClure, R. D., and Lam, C. R.: End-Results in the Treatment of Hyperparathyroidism. *Ann. Surg.*, 1945, 121: 454.

Diseases of the parathyroid glands may give a history of urinary calculi, skeletal abnormalities, pathological fractures, or bone and muscle pains. Roentgenograms of the skull and long bones give confirmatory evidence. Laboratory tests clinch the diagnosis. There is elevation of the serum calcium and phosphatase, and lowering of the serum phosphorus. Six cases are reported.

Case 1. A woman, age forty-four, complained chiefly of pain in the right chest and right thigh. There was an effusion in the chest, and the roentgenogram of the femur showed a destructive process involving the lower third; a pathological fracture of the lower third of the left femur developed. Further studies were carried out. The patient died. Surgery on the parathyroid glands had not been performed. Parathyroid poisoning was considered as a cause of death.

Case 2. A woman, age fifty-one, showed a pathological fracture of the femur. A cystic parathyroid adenoma was removed. The patient died four months later in a hypoparathyroid state.

Case 3. A man, age fifty-one, presented a picture of cachexia. Roentgenograms of the skull and long bones showed osteoporosis. Small areas of calcification were present in both kidney areas. Hyperparathyroidism was confirmed by laboratory studies. A parathyroid adenoma was removed on the right side. The patient made a remarkable, uneventful recovery with complete return to excellent health.

Case 4. A young man, age nineteen, complained chiefly of renal calculi. An exploration of the neck for a parathyroid tumor was carried out. A parathyroid adenoma and a nodule of normal thyroid tissue were removed. Convalescence was uneventful.

Case 5. A girl, age fourteen, complained of "knock knees." Laboratory studies showed an abnormal calcium balance. Roentgenograms were confirmatory. Surgery revealed an adenoma on the left parathyroid gland. Convalescence was almost uneventful. The "knock knee" deformity cleared up without operation.

Case 6. A young girl, age eighteen, complained of a lump in the neck and pain in the right hip. A right parathyroid adenoma was removed. Recovery was uneventful.

The 4 living patients have been followed from four to eight years following operation, and all appear to be normal individuals.

RICHARD J. BENNETT, JR., M.D.

SURGERY OF THE NERVOUS SYSTEM

PERIPHERAL NERVES

Davis, L., Perret, G., and Carroll, W.: Surgical Principles Underlying the Use of Grafts in the Repair of Peripheral Nerve Injuries. *Ann. Surg.*, 1945, 121: 686.

The repair of peripheral nerve injuries has failed to reach the state of a completely recognized definitive plan of treatment. This has been due to the lack of agreement concerning the histological changes associated with regeneration, and the failure to follow up large groups of patients from a clinical viewpoint and thus evaluate the various surgical procedures.

The ideal method in the repair of a severed nerve is accurate end-to-end suture through the perineurium at the earliest time possible. This necessitates the use of very fine silk suture without damage to the nerve fascicles. In large wounds, especially when they are associated with fractures, the possibility of a severed nerve should be kept in mind. If the loss of nerve substance precludes primary suture, the nerve ends should be identified and a metalic suture or clip applied to facilitate surgery at a future date.

It is very important that a potentially infected wound does not deter one from approximating the nerve ends, for regenerating nerve fibers are quite resistant to infection and the perineurium forms an excellent barrier to the surrounding suppuration. Histological evidence reveals that the nerve fiber grows down into the distal segment in the presence of surrounding suppuration. However, regeneration never occurred when the nerve fascicle was infected.

The use of the sufonamides has been a great advantage in preventing infections but it does not imply any let down in performing meticulous debridement and mechanical cleansing. This regime has allowed much earlier exploration for the purpose of performing a later anastomosis without the fear of an infectious flare-up—even when a primary infection had been present.

The use of nerve grafts has not received the credit it deserves. Cable grafts and chemically fixed grafts have not proved satisfactory. However, fresh autogenous and homogenous grafts of essentially the same size of the divided nerve should be used. Of these, only the homogenous graft will, through necessity, usually be obtainable. The autogenous grafts are more satisfactory because the original neurilemma structure persists, and results in an isomorphic structure. The homogenous graft becomes a heteromorphous structure as it is completely replaced and the neurotization follows an irregular course. Nevertheless, a satisfactory neurotization ensues. It is suggested that the distal suture line should be resected and resutured because animal experimentation has shown that by the time the nerve fibers have reached this site cicatricial formation may prevent further downgrowth.

Although the seriousness of concussive nerve damage in gunshot wounds has long been recognized, the authors describe in detail the actual histological changes that result. The immediate damage is much more extensive than seen in sharply severed nerves, and extends for several centimeters both proximal and distal. This is differentiated from wallerian degeneration in that a severe molecular decomposition of myelin and damage to the Schwann cells result, while the mesodermal endoneural elements survive. A resulting heteromorphous structure is then the regenerating picture.

An interesting finding was that nerve contusion may interrupt the continuity of the perineurium and result in an outgrowth of nerve fibers through the defect. This explains the many variations in return of function or lack of regeneration in contusion injuries to the peripheral nerves.

JACK I. WOOLF, M.D.

BRAIN AND ITS COVERINGS; CRANIAL NERVES

Robbins, S. L.: Brain Abscess Associated with Congenital Heart Disease. *Arch. Int. M.*, 1945, 75: 279.

Only 26 cases of the rare syndrome of brain abscess with congenital heart disease have been reported in the literature; this includes the 3 forming the basis of this article. They were selected from 7,880 autopsies performed during the years from 1936 to 1943 at the Mallory Institute of Pathology of the Boston City Hospital.

The 3 cases are well documented and presented from the pathological point of view, although the clinical record is adequate. None was diagnosed before death. All 3 occurred in females aged ten, nineteen, and twenty years, respectively. No focus of infection was found in any case and it was inferred that the involvement of the brain was due to septic emboli from some unknown source. The 3 cases presented the tetralogy of Fallot, which consists of (a) dextroposition of the aorta, (b) pulmonary stenosis, cor pulmonale with a thick-walled right ventricle and (c) a defect in the interventricular septum. One case had a patent ductus arteriosus. Only 2 of the 26 cases in the literature were correctly diagnosed before death.

Attempts were made to produce focal areas of encephalomalacia in rabbits by injecting particulate matter into the internal carotid artery followed in from ten to twelve days by the injection of virulent cultures of organisms. The attempts were unsuccessful and more work on this phase is in progress. The hope is expressed that in these cases of congenital heart disease with focal neurological signs a correct diagnosis may permit the development of successful surgical intervention.

ADRIEN VERBRUGGHEN, M.D.

Ehni, G. J., and Adson, A. W.: Lipoma of the Brain; Report of Cases. *Arch. Neur. Psychiat.*, Chic., 1945, 53: 299.

Lipomas of the brain, because of their extreme rarity and the fact that most of them do not cause symptoms or signs during life, are clinically unimportant tumors. Most of them are unexpectedly encountered at autopsy. Up to this time, the literature, as far as the authors could ascertain, does not contain data on any case of lipoma of the brain which was subjected to surgical attack.

Lipoma of the brain was discovered in 2 cases at the Mayo Clinic. In one of these cases the lesion was productive of symptoms which led to surgical removal.

With the 2 cases reported in this article, 71 cases of lipoma of the brain or of the intradural cranial nerves have been reported in the literature. The favored sites of origin, in their order of frequency, are the corpus callosum, the ventral diencephalic structures, the choroid plexus or the ventricular walls of the lateral and third ventricles, and the dorsal surface of the midbrain.

The mechanism of formation of this lipoma is probably a perversion of differentiation of the primitive meninges. Elements with fat-forming potentialities are present in the meninges, and the lipoma develops when the ectodermal mesenchyme contributing to the leptomeninges is defective.

This tumor has slight clinical importance, but it must be added to the list of lesions requiring differentiation when calcium is discovered on roentgenological examination.

MISCELLANEOUS

Davis, J. H., Morrow, W. J., and Toomey, J. A.: Results in the Treatment of Meningococcic Meningitis with Antitoxin and Sulfonamide Drugs. *J. Pediat.*, S. Louis, 1945, 26: 455.

Results are reported in a series of 309 consecutive cases of epidemic meningitis. The patients ranged in age from two months to eighty years, and coexisting pathological conditions of the heart and kidneys, lungs, liver, or other organs were present in many. Treatment consisted in the administration of from 100,000 to 200,000 units of meningococcus antitoxin combined with sulfanilamide or sulfadiazine in the usual dosages. The latter drug was used in one-half of the cases. The antitoxin was diluted in one liter of the usual isotonic solution containing 3 c.c. of 1:1,000 adrenaline. It was given by intravenous drip over a period of from eight to sixteen hours. When the blood pressure was low, from 5 to 10 c.c. of cortin were given twice daily and the adrenaline was continued at the rate of 3 c.c. of the 1:1,000 solution with every liter of fluid.

The total mortality rate was 13.9 per cent, 43 patients failing to survive. Sulfadiazine did not seem to alter the mortality rate as compared with that following the use of sulfanilamide. When the patients moribund on admission are not included (17 dying within forty-eight hours of admission), the mortality rate is 8.8 per cent (26 of 292). The elimination of 4 other deaths, which were due to secondary causes after apparent recovery from the meningitis, reduces the mortality rate to 7.6 per cent.

The Waterhouse-Friderichsen syndrome developed in 3 patients. Two patients had clinical and bacteriologically proved relapses but both recovered. Seventy-two per cent of the patients who were given serum and who survived over ten days developed serum sickness.

HENRY A. SHENKIN, M.D.

Winter, S. J.: The Treatment of Meningococcic Meningitis in Children with a Single Intravenous Dose of Sodium Sulfadiazine. *J. Pediat.*, S. Louis, 1945, 26: 459.

Nine cases of meningococcal meningitis in children treated with a single large intravenous dose of sulfadiazine are reported. Eight cases received 2½ gr. per pound of body weight and 1 patient received 2 gr. per pound. Sodium lactate (fifth molar) (15 c.c. per pound of body weight) was started by intravenous drip and the calculated dose of sodium sulfadiazine was added to the lactate solution. By means of this single intravenous administration of the drug, only one venipuncture was required in a small child or infant and adequate blood and spinal-fluid levels were maintained over a four-day period. The clinical symptoms subsided more rapidly than usual and spinal-fluid cultures became sterile within twenty-four hours.

HENRY A. SHENKIN, M.D.

Ziegler, L. H., and Osgood, C. W.: Edema and Trophic Disturbances of the Lower Extremities Complicating Prefrontal Lobotomy. *Arch. Neur. Psychiat.*, Chic., 1945, 53: 262.

Of 19 patients having had bilateral prefrontal lobotomies via the lateral approach, as described by Freeman and Watts, 2 of the older ones died of pneumonia in the immediate postoperative period. One had an acute collapse of a lung, but recovered. One has had one convulsion postoperatively. All had rectal and vesical incontinence immediately after the operation. Ten of the 17 survivors continue to have occasional sphincter accidents. One had a short, intense attack of diabetes insipidus.

Eight of the 17 patients followed postoperatively had difficulties related to the lower extremities. Six had bilateral edema of the legs and feet, and in 4 of these it was accompanied by marked tenderness. In 2 cases the edema was accompanied by large bullae appearing on both heels. One patient had edema limited to the feet, and in another, bullae were noted on the heels, unaccompanied by edema. In most instances the edema was mild and tended to remit spontaneously in a period of from three to four months.

An attempt to correlate the occurrence of postoperative edema with the plane of the lobotomy cut, as outlined by iodized oil on roentgenograms of the

skull, in relation to the plane of the coronal suture, failed to give a definite answer. It did appear that there was a slightly better chance of avoiding these sequelae, as well as persisting incontinence, by performing lobotomy in the plane of the coronal suture or anterior to it, rather than more posteriorly.

HENRY A. SHENKIN, M.D.

Brandes, W. W., and Sutton, J. B.: A Presacral Cyst Apparently Arising from the Neurenteric Canal in a Newborn Infant. *Arch. Path.*, Chic., 1945, 39: 265.

Developmental anomalies are not infrequent in the sacrococcygeal region because of its complicated embryological evolution. In this region, early in embryonic life, the neurenteric canal is a communication between the central canal of the spinal cord and the postanal gut. In adult life the postanal gut and the neurenteric canal are obliterated.

A great variety of tumors with various descriptive terms have been described in this region. The author's case is unique in that the cyst was lined throughout with well differentiated glial tissue of uniform thickness. Ependymal cells were present in scattered areas. The structure of the cyst and its position anterior to the sacrum suggested that it arose from the neurenteric canal because the main element was neural tissue.

The infant girl, three days of age, was admitted with a cystic mass the size of a grapefruit, situated posterior to the rectum and anterior to the sacrum. Urination and defecation were not interfered with although the tumor grew very rapidly in size in the three days following birth. There were no clinical indications of any connection with the central nervous system.

The growth was successfully removed at operation.

ADRIEN VERBRUGGHEN, M.D.

Stern, K., and Odom, G. L.: Morphological Alterations of the Neuron Due to Tumor Invasion. *Arch. Path.*, Chic., 1945, 39: 221.

The reaction of the neurons to various intoxications and circulatory disturbances are well known and the reaction of these cells to adjacent pressure has also been studied. In this article the reaction of the neuron to invasion by glioma cells is studied. Postmortem material only was used and various types of gliomatous tumors were found in this series of 36 tumors. Stains of all kinds were employed to show changes in the nerve cells.

Intact neurons were found at varying depths within the tumor and there was often no intermediate stage between complete preservation and complete destruction of the cells. Most of the changes seen were explained on the basis of simple atrophy due to pressure. The changes usually seen in circulatory, infectious, or in toxic diseases were entirely absent in the neurons found in various parts of the gliomatous tumors and a surprising number of the neurons remained intact in the depths of such tumors.

ADRIEN VERBRUGGHEN, M.D.

SURGERY OF THE THORAX

CHEST WALL AND BREAST

Wakeley, C. P. G.: Duct Papillomas of the Breast. *Brit. M. J.*, 1945, 1: 436.

Duct papillomas are nearly always found in the larger ducts and are therefore situated beneath the nipple or the areola. The majority of these tumors are single, but in some cases multiple papillary growths are to be found within the ducts. The common single papilloma often has a stalk, and some pathologists have termed it "single-stalk" papilloma. It always occurs beneath the nipple, and frequently causes bleeding from it.

Wakeley believes that there is too great a tendency today to regard duct papillomas of the breast as malignant or potentially malignant, and therefore requiring amputation of the breast. This he thinks shows a lack of thought, of experience, and of thorough examination of every breast removed. It is incorrect to say that because a young woman has a blood-stained discharge from the nipple the breast should be removed as the possibility of cancer supervenes. A blood-stained discharge from the nipple may be caused by carcinoma, chronic cystic mastitis, or papilloma, but it is the responsibility of the surgeon to make a differential diagnosis of these three conditions.

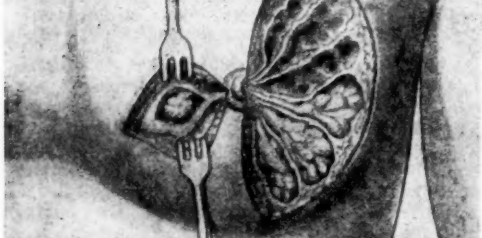

Fig. 1. Diagrammatic drawing of an intracystic duct papilloma. The outer side of the breast is dissected to show the lactiferous ducts during the period of lactation. Inset: The skin incision united by sutures.

Every case must be examined carefully and at definite intervals, until it is certain that a dilated duct can be felt. When this is established, local excision of the dilated duct with the papilloma can be undertaken. The incision should radiate from the nipple over the dilated duct. The skin edges are held apart, the cystic dilatation is opened, and the intracystic papilla is completely excised. The operation is simple, and no damage is done to the ducts on either side. The skin incision is closed with a few interrupted sutures, and when healed is scarcely noticeable.

Every excised papilloma should be examined microscopically for any evidence of malignant disease. The patient should be examined at three-month intervals during the first year; after this time, a yearly examination will suffice.

STEPHEN A. ZIEMAN, M.D.

TRACHEA, LUNGS, AND PLEURA

Tinney, W. S., Moersch, H. J., and McDonald, J. R.: Tumors of the Trachea. *Arch. Otolar.*, Chic., 1945, 41: 284.

The present study is based on a review of 27 cases of neoplasm of the trachea seen at the Mayo Clinic since 1921.

Carcinoma may occur anywhere in the trachea. In the authors' experience the lower third of the trachea is the region most likely to be involved; in 15 of the cases (56 per cent) the lesion occurred in this region. The tumor arose in the upper third in 8 cases and in the middle third in 1 case. In the remaining 3 instances so great a portion of the trachea was involved that the exact site of origin of the primary lesion could not be accurately determined. In general, the tracheal tumors were most frequently situated on the posterior and lateral walls in the lower third of the trachea. The middle third and the anterior wall were least often involved. It is interesting that there was a tendency on the part of a cylindroma to involve the upper third of the trachea, whereas a squamous-cell carcinoma or adenocarcinoma usually was found in the lower third.

The tumor may act as a bivalve and allow air to pass in and out of the lung in decreased quantity. It may act as a stop valve and prevent air from passing in either direction. When the lesion functions as a check valve there may be ingress but no egress of air, in which case emphysema is produced. If the check valve prevents ingress but allows air to escape, atelectasis results.

Only 3 patients had any sensation of tickling or of a lump in the throat. The most frequent and important symptom was dyspnea caused by encroachment of the tumor on, and obstruction of, the tracheal lumen. Dyspnea was a prominent symptom in 24 cases (89 per cent) and was the initial symptom in 22

(81 per cent). Dyspnea may be constant or paroxysmal and is fairly frequently affected by change of position.

Cough was an important symptom in 15 cases (56 per cent). Since cough is caused by the mechanical irritation of the trachea, it is nonproductive at onset, but as the lesion enlarges and causes more tracheal obstruction with secondary infection of the retained secretions, the cough becomes productive. In 12 cases (44 per cent) cough was associated with hemoptysis, which varied from slight streaking of the sputum with blood to profuse hemorrhage. In 2 cases the lesion was so necrotic that pieces of the tumor were expectorated.

Chills and fever, which are frequent accompaniments of bronchogenic carcinoma, are less likely to occur in cases of tracheal tumor.

Roentgenograms taken after the instillation of iodized oil into the trachea help fairly frequently to show the outlines of the lesion and may often lead to the correct diagnosis. Sometimes the tumor may be seen on direct laryngoscopy. However, in most cases of carcinoma of the trachea the diagnosis is dependent on bronchoscopic examination.

The appearance of carcinoma of the trachea varies considerably. The lesion may be flat and infiltrating, or it may be polypoid and pedunculated. Confirmation of the diagnosis, of course, depends on the microscopic examination of tissue removed at the time of bronchoscopy.

Carcinoma situated in the upper portion of the trachea is best handled by means of tracheal fissure and destruction of the tumor by electrocoagulation, as advocated by Figi. After destruction of the tumor, a large tracheotomy tube is left in the trachea, and the site of the tumor can be inspected at frequent intervals for evidence of possible recurrence.

Surgical resection of a portion of the involved trachea has been advocated by various observers, but this carries a much higher operative risk than tracheal fissure, and the results obtained have not been as satisfactory as the results of tracheal fissure and destruction of the tumor by electrocoagulation. In addition, surgical resection leaves the patient with a marked disability which may lead to subsequent difficulty.

Carcinoma situated in the lower end of the trachea is best treated by electrocoagulation of the tumor through the bronchoscope. The implantation of radon into the tumor has been employed rather extensively with questionable benefit. It does seem advisable, however, to employ the radium pack or roentgen rays over the regional lymph nodes. In 1 case in which adenocarcinoma of the trachea was extensive and could not be treated adequately by means of surgical diathermy, the use of roentgen therapy alone was followed by marked benefit.

The best results from the therapeutic standpoint have been obtained in the cases of cylindroma.

Since the lesion is usually far advanced before a correct diagnosis is established, the prognosis of tumor of the trachea is poor. In most cases death is caused by tracheal obstruction, secondary pulmonary suppuration, or hemorrhage. Although the life expectancy of most patients is between six months and one year, there are some notable exceptions. This is true particularly of tumors of the cylindroma group.

McDonald, J. R., Harrington, S. W., and Clagett, O. T.: Hamartoma (Often Called Chondroma) of the Lung. *J. Thorac. Surg.*, 1945, 14: 128.

This article is based on a study of 23 cases of hamartoma of the lung. In 3 of these cases, the tumor was removed surgically. In the remaining 20 cases, the tumor was discovered at autopsy. These 20 cases were part of a consecutive series of 7,972 cases in which autopsy was performed. The incidence of hamartoma of the lung in this series of 7,972 cases was 0.25 per cent. This tumor occurs more frequently than has been recognized. It is strictly benign and only occasionally causes symptoms. In most cases the diagnosis has to be made by roentgenographic examination. A hamartoma should be suspected in every case of solitary lesion of the lung. Frequently, this tumor cannot be distinguished from other lesions of the lung until a specimen of the tumor is examined microscopically.

Although hamartoma of the lung is a benign, slow-growing tumor that usually is asymptomatic, we believe that it should be removed surgically. There are no good tumors and any growing tumor is a menace that should not be tolerated, provided, of course, that it can be removed with reasonable risk. Furthermore, one is limited diagnostically by the roentgenographic appearance of the lesion. There are other more serious lesions of the lung which cannot be distinguished with certainty before operation. In the case of the small peripherally situated tumors, local excision with minimal sacrifice of pulmonary tissue can be carried out satisfactorily. Lobectomy, or even pneumonectomy, may be necessary for larger, centrally situated tumors.

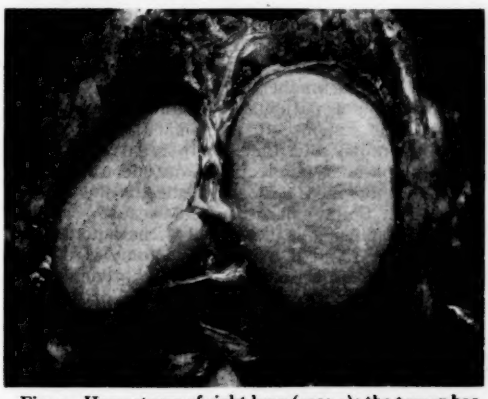

Fig. 1. Hamartoma of right lung (case 3); the tumor has involved the bronchus.

The operation should be performed with intratracheal positive-pressure anesthesia. The approach may be governed by the situation of the tumor but we prefer a posterolateral incision curving around the tip of the scapula. Resection of a long segment of the fifth, sixth, or seventh rib will afford adequate exposure in most instances. Additional exposure can be obtained by resection of short segments of the adjacent ribs posteriorly, if necessary. On palpation, this tumor is hard, round or lobulated, and is surrounded by normal lung. The tumor is usually subpleural but there is no pleural involvement. The extent of pulmonary resection is determined by the situation and the size of the tumor. Frozen sections of the growth should be examined microscopically immediately so that its nature can be determined without question. This is important because, as we have already pointed out, it is impossible to make a positive preoperative diagnosis, and if the lesion should not prove to be a hamartoma, more extensive pulmonary resection might be necessary.

Chamberlain, J. M., and Gordon, J.: Bronchial Adenoma Treated by Pulmonary Resection. *J. Thorac. Surg.*, 1945, 14: 144.

The rapid progress in thoracic surgery has permitted the use of pulmonary resection in the treatment of bronchial adenoma. Although these tumors were first treated by endobronchial removal, pulmonary resection is preferable for the following reasons: (1) it offers a definitive cure; (2) the hazards associated with the damaged lung distal to the tumor are avoided; and (3) some of these tumors are thought to be potentially malignant, and occasionally they metastasize.

Endobronchial removal has four indications: (1) those cases which are not reasonable surgical risks; (2) those which involve the trachea; (3) those with an abscess distal to the tumor which are best prepared for subsequent resection by the bronchial drainage; and (4) the rare cases in which the tumor is entirely within the bronchus, easily accessible, and attached by a long slender pedicle.

The authors report 10 cases of bronchial adenoma. Six patients were subjected to lobectomy, 1 was subjected to pneumonectomy, and 1 to exploratory thoracotomy; 2 patients died following bronchoscopy. The response to pulmonary resection was very favorable, and there were no deaths. In 5 cases lymph-node involvement was encountered.

The authors have performed lobectomy whenever location of the tumor permitted because; (1) submucosal extension is not usually characteristic of these tumors, and if a pneumonectomy is done it includes only 2 or 3 cm. more of the bronchus; (2) the palpable or visible mediastinal nodes may still be resected (these are the most frequent metastatic channel; (3) the morbidity and mortality rates are lower; (4) less of the lung is sacrificed; and (5) a subsequent thoracoplasty may be avoided.

Pulmonary resection completely removes the tumor and the damaged lung distal to the obstruction.

Endobronchial therapy lacks the advantages mentioned and has some disadvantages. It requires repeated manipulations since local recurrences are frequent, and the risk of severe hemorrhage is always a consideration. Cicatrization may occur following repeated bronchoscopic treatments with or without the use of radon. Such scarring and stenosis interferes with the cleansing mechanism of the bronchus (ciliary action, bronchial peristalsis) and predisposes to pulmonary suppuration. The principal therapeutic objective of maintaining a patent airway is defeated if cicatricial stenosis is substituted for an obstructing tumor. Even in the absence of scarring and local recurrence, stenosis may occur. It is of interest that the cause of death in these cases is due, usually, to pleural and pulmonary suppuration following the bronchial obstruction, and occasionally to fatal hemoptyses following bronchoscopic manipulation, yet there is no record of a death due to metastases.

JOSEPH K. NARAT, M.D.

Seybold, W. D., and Clagett, O. T.: Cardiovascular Disturbances following Pneumonectomy. *Surgery*, 1945, 17: 538.

The records of 28 patients on whom pneumonectomy had been performed were studied to determine the frequency and magnitude of a significant fall of the blood pressure on their return from the operating room to the hospital room. Of these 28, 17 (61 per cent) had a significant drop (average 35 mm. of mercury) in blood pressure.

The duration of the abnormal reduction of blood pressure varied widely, with forty minutes as the minimum and forty-eight hours the maximum. The average time required for return of the pressure to approximately normal, that is, preoperative levels, was nine and six-tenths hours.

Determinations of the intrapleural pressure were made on 5 patients immediately after closure of the thorax following pneumonectomy. These determinations were made with the patient in three positions. Simultaneous records of the blood pressure and pulse rate were kept. Records of a number of other patients were reviewed for data pertinent to this study.

In cases in which the mediastinum was mobile, changes in the position of the patient produced changes in the intrapleural pressure, but no constant change in the blood pressure or pulse rate could be correlated with these changes.

As factors in this postoperative lowering of the blood pressure, hemorrhage, anoxia, and cardiovascular reflexes mediated through the vagus were briefly considered.

HEART AND PERICARDIUM

Blalock, A. and Taussig, H. B.: Surgical Treatment of Malformations of the Heart. *J. Am. M. Ass.*, 1945, 128: 189.

Up to this time there has been no satisfactory treatment for pulmonary stenosis and atresia. A

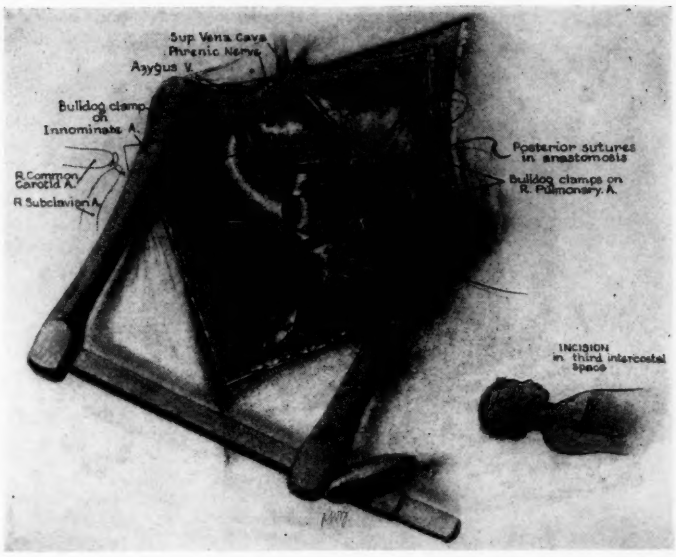

Fig. 1. General exposure of the operative field on the right side. The end of the innominate artery is being anastomosed to the side of the right pulmonary artery. The posterior row of sutures is complete. The anterior row has not been inserted.

"blue baby" with a malformed heart was considered beyond the reach of surgical aid. However, within the past three months the authors operated on 3 children with severe degrees of pulmonary stenosis and each of the patients was greatly benefited. The results have been sufficiently encouraging to warrant an early report.

These operations were undertaken with the conviction that even though the structure of the heart was grossly abnormal, it might be possible to alter the course of the circulation so as to lessen cyanosis and the resultant disability. The cyanosis per se is not harmful but is only a visible manifestation of the underlying anoxemia and compensatory polycythemia. Cyanosis appears when there is at least 5 gm. of reduced hemoglobin (100 c.c. of circulating blood). One of the principal factors producing cyanosis in malformed hearts is the direct shunting of venous blood into the systemic circulation. Lundsgaard and Van Slyke list four important factors in the cause of cyanosis:

1. The reduction of the hemoglobin
2. The volume of venous blood shunted into the systemic circulation
3. The rate of utilization of oxygen by the peripheral tissues
4. The extent of aeration of the blood in the peripheral tissues

These investigators showed that in cases with a profound polycythemia, secondary changes occurred in the lungs which were of such nature that all the blood passing through the lungs was no longer in effective contact with the oxygen in the alveoli. These specific pulmonary factors may overshadow another vitally important factor—the volume of blood which reaches the lungs for aeration.

The circulation of blood through the lungs after birth is essential to life. All infants with pulmonary atresia with or without a right ventricle and with or without dextra position of the aorta, in whom the closure of the ductus closes off the circulation to the lungs, die at an early age.

Two different types of congenital malformations illustrate the importance of the volume of pulmonary circulation in producing cyanosis. If there is a single ventricle and a rudimentary outlet chamber, usually a great vessel is given off from the common ventricle and a rudimentary vessel of small size from the outlet chamber. If the great vessel is the aorta and the lesser the pulmonary artery, the large volume of blood goes to the systemic circulation and the cyanosis is intense. If the vessels are reversed, the large volume of blood goes to the lungs for aeration, and there is minimal or absent cyanosis. If the pulmonary artery fails to arise from the heart or connect with the aorta, the circulation of the blood to the lungs occurs through the bronchial arteries only and cyanosis is intense. If there are anomalies of venous return with all the pulmonary veins draining into the right auricle, the arterial and venous blood mix and a large volume of blood reaches the lungs for oxygenation. Unless there is cardiac enlargement on the

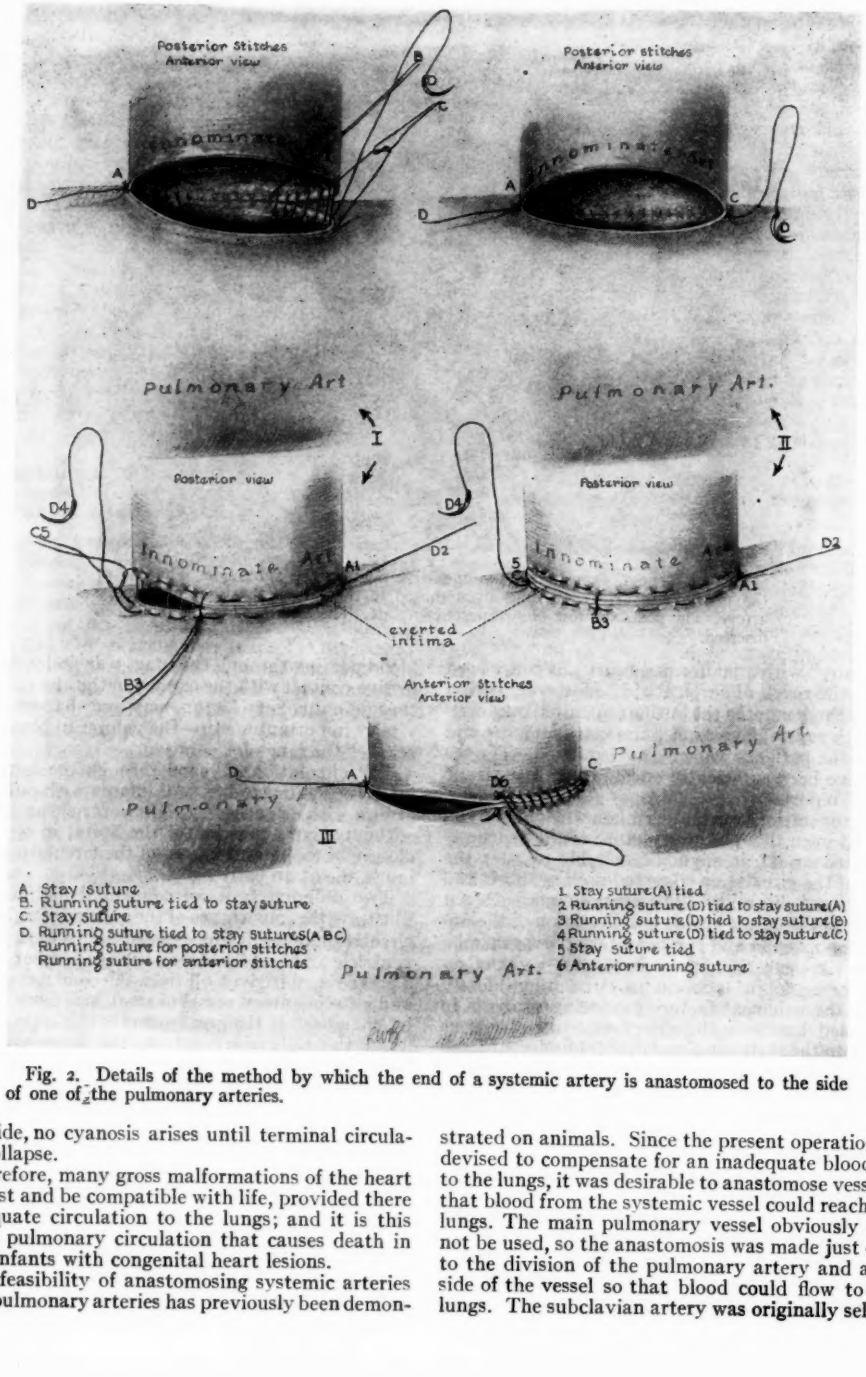

Fig. 2. Details of the method by which the end of a systemic artery is anastomosed to the side of one of the pulmonary arteries.

right side, no cyanosis arises until terminal circulatory collapse.

Therefore, many gross malformations of the heart can exist and be compatible with life, provided there is adequate circulation to the lungs; and it is this lack of pulmonary circulation that causes death in many infants with congenital heart lesions.

The feasibility of anastomosing systemic arteries to the pulmonary arteries has previously been demonstrated on animals. Since the present operation was devised to compensate for an inadequate blood flow to the lungs, it was desirable to anastomose vessels so that blood from the systemic vessel could reach both lungs. The main pulmonary vessel obviously could not be used, so the anastomosis was made just distal to the division of the pulmonary artery and at the side of the vessel so that blood could flow to both lungs. The subclavian artery was originally selected

as the ideal vessel to anastomose to the side of the pulmonary artery, but later cases showed the innominate artery preferable in patients with a severe degree of anoxemia.

Except for slight variations in the 3 cases, the major procedures were as follows:

Light general anesthesia with ether or cyclopropane was used. The patient was placed on his back with the exposed side slightly elevated (the operation was performed on either side according to the position of the great vessels and the artery to be used in anastomosis). The incision was made in the third interspace and extended from the sternum to the axillary line. The pleural cavity was entered and the third and fourth costal cartilages were cut to allow the ribs to be spread and give an exposure as in Figure 1. The right or left pulmonary artery was exposed and freed from the adjacent tissue as far as possible. On the right side this was more difficult and necessitated ligation of the azygos vein and retraction of the superior vena cava medially.

The systemic vessel (subclavian or innominate artery) was then freed, and its origin at the aorta occluded with a bulldog arterial clamp. When the innominate artery was used, its branches, the subclavian and the common carotid, were ligated at their origins and the innominate artery was cut just proximal to the ligatures. In using the subclavian, the thyrocervical, vertebral, and internal mammary branches had to be divided to provide sufficient length of vessel. The right or left pulmonary artery was then occluded with a bulldog clamp just distal to the division point of the main pulmonary artery. A second clamp was placed just proximal to the point where the vessel gave off a branch to the upper lobe of the lung. A transverse opening in the vessel was made between the clamps the same diameter as the systemic vessel to be anastomosed to it. The pulmonary artery was not occluded until all preparations for the anastomosis had been made. For the anastomosis fine silk on a curved needle was used. A stay suture was placed at one end and a running suture inserted, which was not drawn taut until the greater part of the posterior row was in place. The stay suture was then tied and the running suture in turn was tied to the stay. The posterior row was completed and in turn tied to another stay suture. The anterior row was a continuous through-and-through suture approximating intima to intima. Figure 2 shows the anastomosis. The bulldog clamps were removed and any bleeding was stopped by the use of additional sutures. The lung was re-expanded and the chest wall closed with braided silk to approximate the ribs. The chest-wall tissues were closed with multiple layers of interrupted silk sutures.

Three cases are presented in detail and in each one there was a severe degree of pulmonary stenosis with inadequate circulation to the lungs. Although each operation differed in detail, in each instance the operation greatly increased the volume of blood reaching the lungs. In the first case (Fig. 3) the end of the left subclavian artery was anastomosed to the side of the left pulmonary artery. The patient was a small weak baby which had been steadily losing ground. After operation the clinical improvement was remarkable. The baby's appetite improved, she gained weight, and is now starting to learn to walk.

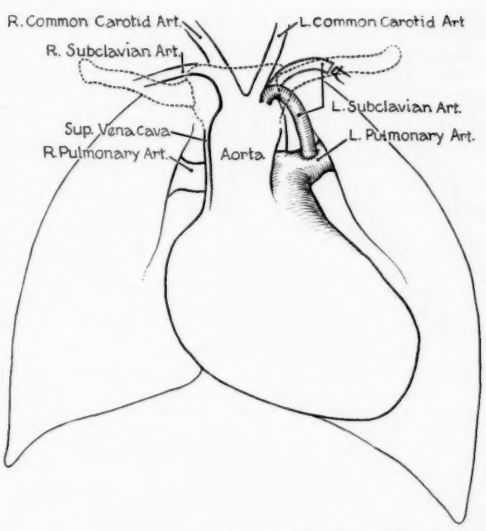

Fig. 3. The end of the left subclavian artery was anastomosed to the side of the left pulmonary artery.

The second patient had a right aorta, and it was possible to anastomose the innominate artery to the left pulmonary artery (Fig. 4). This patient was deeply cyanotic and severely incapacitated—she was unable to walk 30 ft. without panting. Two and one-half weeks after the operation she walked 60 feet, rested a while and walked 60 feet back without panting. Before the operation the oxygen saturation of the arterial blood was 36.3 per cent and three weeks after the operation it had risen to 82.8 per cent. The red-blood count dropped from 7.5 to 6 million; the hemoglobin from 24 to 17 gm., and the hematocrit from 71 to 55.

The same operation was performed in the third case, but here the aortic arch was in the normal position. The operation was done on the right side—anastomosis of the end of the innominate artery to the side of the right pulmonary artery (Fig. 5). The improvement was dramatic. The child had been deeply cyanotic before the operation, but now his color was good even without oxygen after the operation. There was a marked improvement in his disposition, and by the third postoperative week he was walking 40 feet without panting or becoming cyanotic. The oxygen saturation rose from 35.5 to 79.7 in nine days and by twenty-four days it was 83.8 per cent. The red-blood count fell from 10 to 6 million with a corresponding fall in the hematocrit and hemoglobin.

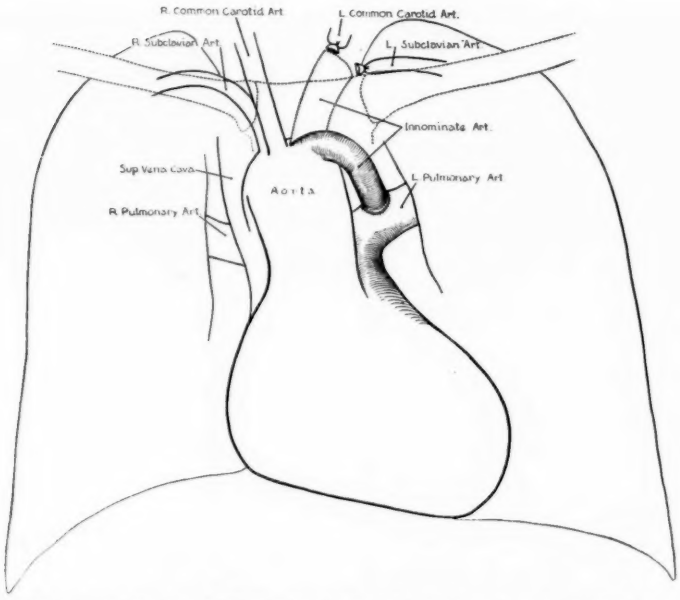

Fig. 4. Procedure used. The patient had a right aortic arch, and the innominate artery was directed to the left. The end of the innominate artery was anastomosed to the side of the left pulmonary artery.

The authors were fearful that an intensely cyanotic child would not tolerate a long operative procedure involving opening of the pleural cavity and temporary occlusion of one of the pulmonary arteries. In their limited experience this type of patient can tolerate inhalation anesthesia well. High oxygen concentrations were employed and often they definitely decreased the cyanosis. A slow plasma drip given intravenously is advisable. With these precautions, no great difficulty was encountered even though two of the three operations required three hours.

Another question answered by these 3 cases was: Would a patient suffering from a severe degree of anoxemia tolerate the occlusion of one of the main pulmonary arteries for the period of the anastomosis? These periods of occlusion were approximately thirty, sixty, and ninety minutes, and remarkably enough the cyanosis did not appear to be greatly increased by the occlusion. Possibly this was due to the fact that the decreased blood flow to the lungs caused by the congenital deformity rendered it possible for the opposite artery and lung to utilize this reduced volume almost as effectively as could two lungs.

Division of the subclavian artery or of the innominate artery failed to show any serious impairment of circulation to the parts deprived of their major arterial pathway. The pulse was absent and the part was cooler immediately after the operation. The authors suggested that a dorsal sympathectomy might be of value if done at the time of the operation. This procedure would be simple with this exposure and would not add to the gravity of the operative procedure. The type of anastomosis to be performed depends on the age of the patient, the anatomy present, and the degree of anoxemia. The authors suggest the anastomosis of the subclavian or innominate artery to the side of the right or left pulmonary artery. This principle is sound and allows systemic blood to flow to the lungs. The continuous murmur heard on both sides of the chest indicates that the anastomosis directs blood to both lungs. The subclavian artery is the easiest to anastomose, but its size in infants may limit the flow of blood to the lungs to such a degree that the severer degrees of anoxemia may not be overcome. Therefore the selection of the vessel to be used depends on the extent of the patient's need for an increase in circulation to the lungs. Obviously the vessel chosen and the size of the anastomosis should be no larger than is necessary for the relief of anoxemia because of the danger associated with excessive shunting of blood to the lungs.

The authors then discuss other methods of uniting a systemic artery to the pulmonary circulation. These are:

1. Anastomosis of the divided proximal end of one of the vessels which arise from the aortic arch (innominate, left common carotid or left subclavian) to the divided distal end of one of the pulmonary arteries

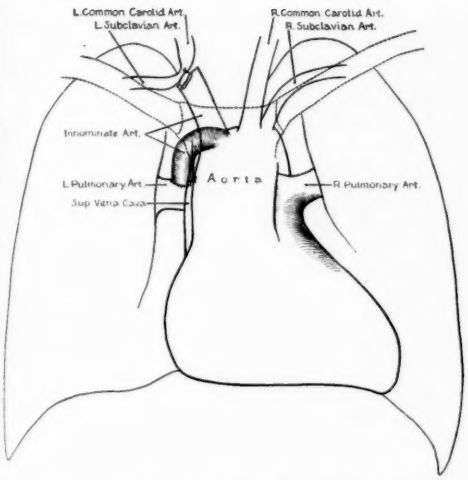

Fig. 5. The end of the innominate artery was anastomosed to the side of the right pulmonary artery.

2. Anastomosis of the divided proximal end of the subclavian or the common carotid artery to the divided proximal end of the pulmonary artery to an upper lobe of one of the lungs
3. Anastomosis of the side of the aorta to the side of the left pulmonary artery
4. Anastomosis of the side of the aorta to the main pulmonary artery

One of the possible complications of these operations is the danger of thrombosis at the anastomotic site. The improvement of the 3 patients described indicated that it did not occur. As these patients usually have a polycythemia and an increased viscosity of the blood, the authors used dicumarol in small daily doses controlled by daily prothrombin determinations to regulate the clotting time to double the normal. The medication was continued for a three-week period after the operation, and its value in these cases may be questioned.

The types of abnormalities which should be benefited by this operation are the tetralogy of Fallot, pulmonary atresia with or without dextroposition of the aorta and with or without defective development of the right ventricle, a truncus arteriosus with bronchial arteries, and a single ventricle with rudimentary outlet chambers in which the pulmonary artery is small in size. The operation is indicated only when there is clinical and roentgenological evidence of a decreased pulmonary blood flow. The operation is not indicated in cases of complete transposition of the great vessels or in the so-called "tetralogy of Fallot of the Eisenmenger type," and probably not in aortic atresia. It must be emphazied that the operation should not be performed when studies reveal a prominent pulmonary conus or pulsation at the hili of the lungs. ROBERT R. BIGELOW, M.D.

ESOPHAGUS AND MEDIASTINUM

Harper, R. A. K., and Tiscenco, E.: Benign Tumor of the Esophagus and Its Differential Diagnosis. *Brit. J. Radiol.*, 1945, 18: 99.

Benign tumors of the alimentary tract as a group are not infrequent but are relatively rare as compared with malignant conditions.

The clinical symptoms can be briefly summarized in the approximate descending order of frequency: (1) intermittent retrosternal sensation of dull pain or of pressure, or of an "aching sensation" which was usually referred to the lower or middle part of the sternum, being sometimes aggravated by lying on the back; (2) epigastric pain after meals or without any relation to food; (3) anorexia; (4) dysphagia, often the intermittent type; (5) occasional vomiting or a copious vomiting due to dilatation of the esophagus similar to achalasia; and (6) loss of weight.

The author reports a case in which the diagnosis of a benign intrinsic extramucosal tumor of the esophagus was made roentgenologically. The male patient, age forty-one, was operated on and the tumor was found on the posterolateral side of the esophagus. The mucosa was found to be intact. The only pedicle was of avascular fibrous tissue. The microscopic appearance was that of a leiomyoma.

The author concludes from his observation that the roentgenological diagnosis of an intrinsic extramucosal tumor of the esophagus is a diagnosis by exclusion.

It is obvious that a distinction has to be made primarily between extrinsic and intrinsic conditions and, secondly, between the mucosal and extramucosal origin of the intrinsic process.

In the superior mediastinum direct pressure on the esophagus can be exerted by an aneurysm of the posterior part of the aortic arch, aneurysm of the left subclavian artery, or enlarged paratracheal or retroesophageal glands, but rarely by a retrosternal goiter, neurofibroma, esophageal pulsion diverticulum, substernal parathyroid tumor, or cold abscess of the upper thoracic spine. Indirect pressure may be transmitted by the trachea pushed posterolaterally by aneurysm of the innominate artery.

From the middle mediastinum the esophagus can be distorted by indirect pressure from aneurysm of the root of the aorta which pushes the tracheal bifurcation backward, aneurysm of the ascending aorta pushing the trachea to the right, or aneurysmal dilatation of the main pulmonary artery pressing upon the left main bronchus. By direct contact the deformity of the esophagus could be brought about by aneurysm of the junction of the arch with the descending aorta, bronchial hilar carcinoma, particularly of the left main bronchus, enlargement of the left auricle, dilatation of the left ventricle, pericardial effusion, and, of course, also by enlarged glands (tuberculosis, or secondary malignant and lymphoblastomatous glandular enlargements), bronchogenic or lymphangiomatous cystic tumors, or fibrous mediastinitis.

From the posterior mediastinum the outline of the esophagus could be distorted directly by an aneurysm of the descending aorta; a kinked, tortuous arteriosclerotic thoracic aorta; chronic diffuse fibrous mediastinitis; posterior mediastinal hernia (particularly in tension pneumohydrothorax); or any massive tumor; and indirectly by left-sided ganglioneuromas which might exert pressure by displacement of the descending aorta anteromedially.

Generally speaking, the effect of an extrinsic process upon the esophagus may be twofold, deformity by traction and deformity by pressure. The former is commonly the feature of adherent tuberculous glands or of fibrous mediastinitis. The deformity by extrinsic pressure is usually comparable with the familiar appearance of the aortic-arch impression or with that of an enlarged left auricle.

Strictly speaking, there is no doubt that an extrinsic mass, whether attached or not, might make the impression of an intrinsic extramucosal condition.

A differential diagnostic clue may be looked for in the extent by which the circumference of the soft-tissue mass appears attached to the esophagus. In the intrinsic extramucosal tumor the greater part of the circumference of the visible soft-tissue mass would be within the pressure defect, whereas in the extrinsic tumor a relatively smaller part of the circumference would make contact with the esophageal outline.

Stress is laid by the author on the fork-like appearance of the barium shadow resulting from the splitting of the barium column as it impinges on the protruding tumor mass so that the barium would seem to trickle along a kind of a gutter on each side of the tumor. JOSEPH K. NARAT, M.D.

Truesdale, P. E.: A New Guide in the Operation for Esophageal Hiatus Hernia of the Diaphragm. *J. Thorac. Surg.*, 1945, 14: 160.

The surgical treatment of esophageal hiatus hernia has not been generally adopted even among surgeons. Many patients with this condition continue to suffer even on dietary and medical management, and surgery is not considered because of the extensiveness of the procedure and the higher mortality than that of the usual herniorrhaphy. Instead of a standard operative procedure, such as is used for other forms of hernia, the technique of dealing with the sac and hiatus in esophageal hiatus hernia is still under controversy and a simplification of method is desirable.

The author has used both the abdominal and thoracic approach to repair these hernias. Harrington of the Mayo Clinic reported 102 cases repaired through an abdominal incision. He describes the anatomy of the central area of the diaphragm from below and points out the advantage of being able to explore the upper abdomen for other lesions which might be the real cause of the patient's complaints. This is of no small importance as the hiatus hernia may be asymptomatic and peptic ulcer, cholecystitis, gall stone, early gastric carcinoma, subacute or chronic pancreatitis, or aortic aneurysm may produce the symptoms.

Truesdale operates on hiatus hernia after it has been demonstrated by x-rays and after all conditions with similar symptoms have been ruled out as completely as modern methods of diagnosis permit. He presents a series of 50 cases, 26 of which were operated upon through the thorax and 24, by the abdominal approach. He favors the thoracic approach since it offers better exposure and a definite anatomical landmark for locating the hernial sac. There were 4 deaths among the 50 patients, an 8 per cent mortality. Three deaths (12.5 per cent) occurred in the group operated upon through the abdomen, and 1 death occurred in the 26 operated upon through the thorax. Two of the deaths were from mediastinitis following esophageal injury. One patient died of peritonitis due to perforation by a silk suture used to anchor the cardia to the diaphragm. The last death occurred from a cerebral accident twenty-six days after the operation.

The author believes that 3 of the deaths were avoidable, and that accurate knowledge of the location of the sac, careful orderly procedure, and care not to suture the stomach to any part of the innervated diaphragm will lead to better results.

Through the abdominal approach exposure of the field of operation is almost impossible because of the high position of the central portion of the diaphragm and the roofing of the rib cage and the sternum. Long instruments and retractors are necessary to overcome this handicap.

The hernial sac extending into the mediastinum often carries the cardiac end of the stomach with it. Seen from above the sac lies attached to the anterior aspect of the esophagus just along the internal aspect of the descending aorta. The identification and separation of these structures requires the utmost deftness and accessibility, which are possible only with the thoracotomy approach.

On one underweight person the thoracic approach yielded an unusually good exposure and a triangular space was easily identified, bounded by the left ventricle on the right, on the left by the descending aorta, and below by the diaphragm. The apex of the triangle reached the hilus of the lung. Within this space small lobules of preperitoneal fat were seen and upon separating them, the serosa of the hernial sac was exposed. The author stresses the importance of this anatomic clue in simplifying the identification of the hernial sac for reduction and repair of the hernia.

The hernial sac invariably passes upward, lies superimposed on the esophagus, and overlaps the descending aorta as both structures pass through the floor of the triangular space. The cardia of the stomach is often contained in the sac, because the serosa forms the sac and carries the cardia and its vessels along. It is necessary to sever these vessels in order to reduce the stomach and remove the sac. Often these veins are dilated due to constriction, and this probably explains the source of the blood loss and

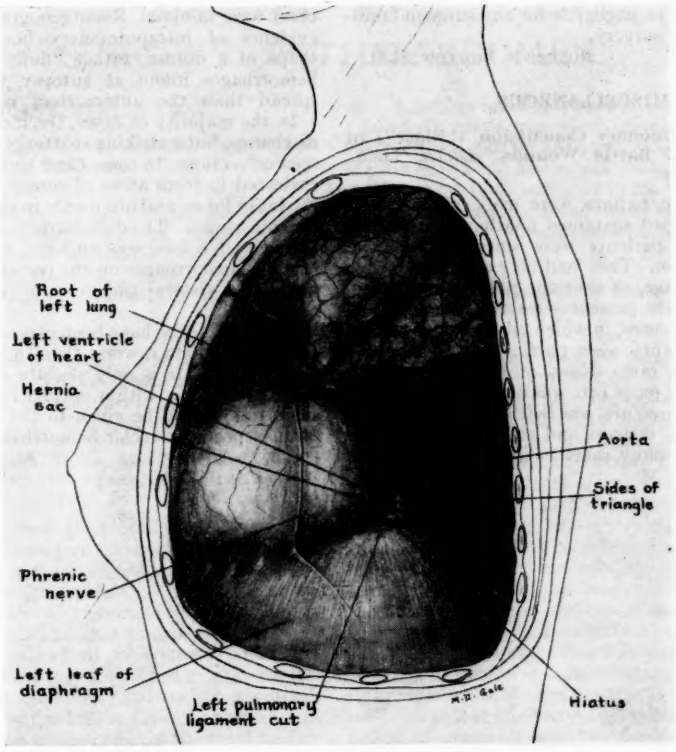

Fig. 1. Structures bounding the triangular space above the hiatus.

anemia common in patients suffering from esophageal hiatus hernia. The author has observed occult blood in the stools in 34 per cent of his cases.

In order that the roentgenograms clearly define the hernial sac, they must be taken in the exaggerated Trendelenburg position. Due to the great depth of the operative field and the number of important structures surrounding the triangle, one can easily understand the varied symptoms arising as a result of the changes in size and tension of the hernial sac.

The operative procedure usually done starts with a subperiosteal resection of the entire seventh rib. The pleura is incised, and the lung freed and packed back with a moist lap pad. The pulmonary ligament is severed, and the triangle identified as in Figure 2. The preperitoneal fat is separated and the sac picked up and incised; a finger is then inserted. The sac is apt to be larger than the roentgenogram suggested, and it may contain stomach, colon, omentum, or small intestine. The sac is covered with thin serosa; the pleura is on the outside and the peritoneum lines it. The stomach with its vessels is often attached by a short mesentery to the peritoneum within the sac.

With the index finger within the sac, it can be dissected bluntly with a sponge from the esophagus, lung, and aorta. The vessels attaching the stomach to the peritoneum are ligated and cut, and the stomach is reduced. The sac is freed entirely and removed after ligation. If the base of the sac is large, it may be closed with interrupted fine silk sutures. Reinforcement of the hernial orifice in the diaphragm is accomplished with interrupted medium size silk sutures. The chest wall is closed with running sutures of fine chromic catgut in the pleura, and the muscular layers are reinforced with mass sutures of nylon.

The question of securing a quiet field in which to operate is controversial; exeresis, cutting or crushing of the phrenic nerve, or injection of this nerve with alcohol or novocaine has been used. The author did not cut the nerve, but tried the other three methods to quiet the diaphragm. Patients in whom the nerve was crushed usually had a prolonged dyspnea during the postoperative period. Truesdale suggests a local anesthetic or that anesthesia of the nerve be avoided whenever possible.

If the operation is conducted on these principles, it will be less formidable and more successful, and the

mortality should be negligible for any surgeon familiar with thoracic surgery.

ROBERT R. BIGELOW, M.D.

MISCELLANEOUS

Savage, O.: Pulmonary Concussion ("Blast") in Nonthoracic Battle Wounds. *Lancet*, Lond., 1945, 248: 424.

Complete examinations were made of 87 battle casualties who had sustained nonthoracic wounds. Most of these patients were unconscious while under observation. They had no external evidence of thoracic damage, so that the pulmonary hemorrhages which were present were unsuspected; but even in the later cases, in which clinical signs of pulmonary abnormality were particularly looked for, they were quite rare. None of the patients had hemoptysis. The pulse rate was only slightly raised, and the blood pressure was within normal limits. Some respiratory distress and stertorous breathing were present in many cases. Physical signs in the chest were minimal. Roentgenography provided the evidence of intrapulmonary hemorrhage, in the shape of a diffuse, rather "fluffy" mottling. The hemorrhages found at autopsy were more widespread than the antemortem picture suggested.

In the majority of cases, the lung surface showed no change, but a striking spatter of hemorrhages was seen on section. In some cases the hemorrhages had coalesced to form areas of consolidation, always in the lower lobes, and often only in the posterior costophrenic fringes. The distribution of the hemorrhages throughout a lobe was uniform, from periphery to hilum. Hemorrhages on the parietal pleura and beneath the visceral pleura were present in several cases.

In patients who have been exposed to blast, whose clinical condition is worse than the wound warrants, whose pulse rate is only slightly raised, and whose blood pressure is within normal limits, careful consideration should be given to the possible presence of unsuspected alveolar hemorrhage.

SAMUEL KAHN, M.D.

SURGERY OF THE ABDOMEN

GASTROINTESTINAL TRACT

Howard, J. T.: Experiences with the Gastroscope over a Period of Six Years. *South. M. J.*, 1945, 38: 293.

After six years of experience with the gastroscope, Howard emphasizes that the use of this instrument enables the examiner to see clearly a large portion of the interior of the stomach. Most of the gastric tumors can be visualized as well as some gastric ulcers and gastritis.

Gastroscopy is an adjunct to roentgenography but is less critical than the latter. The author believes that the diagnosis of chronic gastritis is interesting but usually not of great clinical importance.

BENJAMIN GOLDMAN, M.D.

Smith, C. S., Wikoff, H. L., and Southard, B. A.: Gastric Acidity in Apparently Healthy Individuals. *Am. J. Digest. Dis.*, 1945, 12: 117.

The authors present their findings in a series of fractional gastric analyses conducted for the past fifteen years as a part of the fundamental course in physiological chemistry at the Ohio State University, College of Medicine. Fifty normal healthy students served as subjects. The gastric contents were collected according to standard procedures after feeding of either the Ewald or the alcohol test meals. Gastric data, including the maximal total acidity, the maximal free hydrochloric acid, the time of occurrence of each, and the shape of the curve of the total acidity were thus obtained. Comparisons were drawn between the so-called normal values listed in modern text books and the values obtained from the study of the group of 50 healthy subjects. It was found that the variations in normal gastric acidity are far greater than those listed in standard text books.

The majority of the standard text books give the values for maximal total acidity varying between 40 and 100 degrees. Considerably lower values were found in 38 of the subjects reported on in the present article, the values being between 20 and 60 degrees. The maximal value for any subject was 90 degrees. More than half of the total number of subjects reached their total maximal acidity by the end of forty-five minutes, instead of after from sixty to ninety minutes, as given in the text books. The maximal values for free hydrochloric acid in the subjects reported on agree with the text-book values somewhat better than do the values for total acidity. In 29 subjects the maximal free hydrochloric acid was between 29 and 59 degrees; that in the text books varied from 20 to 70 degrees. However, of the total number of subjects, 28 reached their maximal value in less than the sixty-minute interval said to be normal.

Since these results varied so greatly when compared with each other and with the published standards, a further investigation was conducted in which a few individuals were used repeatedly as subjects for fractional gastric analyses. These persons were in good health and had no gastric disturbances. Here again, considerable variation in the gastric acidity of the individual subjects was shown by repeated analyses of the same subject, carried out at intervals of a few days.

MATHIAS J. SEIFERT, M.D.

Aaron, A. H.: Inflamatory Lesions of the Upper Gastrointestinal Tract. *J. Am. M. Ass.*, 1945, 127: 1027.

This was a paper presented before a joint medical and surgical meeting in which the author discussed certain advances in the diagnosis and treatment of lesions of the stomach and duodenum that have taken place in the past few years.

Since it is important to assure a patient with an ulcerated lesion of the stomach when complete healing is present, the author suggests the following criteria for healing of ulcerated lesions of the stomach: (1) complete cessation of all symptoms; (2) maintenance or gain in weight; (3) persistent absence of occult blood from the feces; (4) disappearance of the anemia of the iron deficiency and essential factor type; (5) a normal sedimentation rate; (6) roentgenological evidence of complete healing; and (7) if it is possible to obtain it, confirmation by gastroscopy. Only when these studies are repeated over a four-to-six-week period of observation can we be sure that a lesion of the stomach has healed and remained healed, and is thus most likely to be benign. If this does not occur, the patient is entitled to surgical intervention.

Fordyce B. St. John routinely examined by fluoroscope the stomach and duodenum of 2,413 patients without digestive symptoms and found 54 with deformed duodenal bulbs. Some presented craters, but the majority had scars of healed ulcers; 7 had cardiospasm, 25 had diaphragmatic hernias (2 very large), 2 had stomach carcinomas, 1 had a lymphosarcoma of the stomach, and 1 had a gastric polyp. Many functional derangements of tone, motility, and emptying time also were revealed. The author believes that routine or mass x-raying of the upper gastrointestinal tract may in time attain the same importance as similar studies of the lungs.

Bird, Limper, and Mayer collected 243 proved cases of peptic ulcer in children; 111 in patients ranging from infancy to seven years of age which were of acute nature, and the remainder in patients between the ages of seven and fifteen years which revealed characteristics like those in adults. Of the 132 older children 78 were male and 45 female. Eighty-five of the ulcers were in the duodenum or pylorus. The author concludes from this evidence that children with continued digestive disturbances should have their upper gastrointestinal tract studied by means

of x-rays to reveal the possibility of the presence of a peptic ulcer. Also, since psychosomatic factors are considered of great etiological significance in peptic ulcer in an adult, more effort should be made to correlate the psychiatric problems of the child and the adult.

Aaron lists the following criteria for the surgical treatment of ulcer: (1) perforation, (2) recurring hemorrhage or hemorrhage in the older ulcer type, (3) pyloric obstruction, (4) suspicion of the presence of a malignant ulcer, (5) revamping of previous surgical procedures, (6) frequent recurrence following medical care, and (7) the type of work of the individual and necessity of his rapid resumption of essential work.

Walters and Butt recently stated that they believe that possibly a larger majority of patients with an active, chronic or recurring ulcer may be returned to active duty if they are subjected to partial gastrectomy. These authors believe that surgical treatment deserves wider use, but frankly state that further study is needed to determine whether radical treatment by gastric resection is warranted.

Army examinations of the age group between eighteen and thirty-five have suggested that there are many with undiscovered and incompletely treated peptic ulcers. Patients with epigastric distress and discomfort readily receive relief with proprietary antacid substances and often do not see a physician. A physician often inaugurates a treatment before x-ray studies are undertaken, or the therapeutic response is so spectacular that follow-ups are inadequate to determine a cure. These factors often result in the production of an intractable ulcer. It is necessary to inaugurate a program for the control and cure of peptic ulcer, to educate the young person with epigastric distress to seek a physician's care, and to educate the physician to give a careful history and roentgenological workup to any patient with a two-week history of periodic epigastric distress. As to the etiology of peptic ulcer, the author believes that for some undetermined reason an area of the stomach and duodenum loses its ability to resist the digestive action of the acid peptic secretion. Also, surgical experience has shown that the production of the achlorhydric stomach is necessary in order to avert postoperative peptic ulcer.

Surgeons with many operative procedures for the treatment of ulcer have benefited from their experience and have emerged with procedures for the production of achlorhydria as the basic principal of treatment.

This idea was first laid down as a medical dictum and the medical men still are confused about the treatment as indicated by a list of some 50 antacids and antispasmodics currently in use in the treatment of peptic ulcer.

Acid gastric secretion is controlled by the sight or odor and the presence of food in the stomach and intestines through endocrine factors and secretagogue substances in the prepyloric portion of the stomach and intestines. Resentment, hostility, anxiety, and aggressiveness all produce hypersecretion, hypermotility, deeper color, increased congestion, and even superficial ulceration. This was shown by Wolf and Wolff in a patient with a gastric fistula and a portion of stomach herniated on the abdominal wall. On the other hand, sadness, discouragement, and self reproach produced pallor of the mucosa and hyposecretion.

Aaron believes that a person with epigastric periodic distress who shows hypermotility and hyperirritability of the prepyloric area of the stomach and duodenum and who has the right psychosomatic make-up should be considered as possessing the precursor of an ulcer and treated accordingly without waiting for a crater to form.

These patients respond well to a broad generous diet without condiments and roughage—three regular meals a day with inbetween, bedtime, and night feedings of sweet cream, eggnogs, or bread and butter. Alcoholic drinks should not be taken, and excess caffeine should be avoided. Smoking should be curtailed but not necessarily eliminated.

The removal of the psychosomatic factors is a more difficult part of the treatment. Diet education and the physician's interest in the patient's problems often make the patients feel safer and protected and many show immediate improvement, a thing that hospitalization may not accomplish.

Patients who do not respond to the "diet educational" plan in ten days will need the introduction of a small group of therapeutic agents: (1) a simple sedative such as phenobarbital, which is to be administered prior to a period of anticipated stress or strain; (2) alkalis and adsorbers such as calcium carbonate (1.0 gr. every 1, 2, or 3 hours) after meals, or aluminum hydroxide (0.6 gm.) which precipitates mucoproteins and diminishes peptic digestion; and (3) belladonna (1/8 gr.) taken twenty minutes before meals to block out vagal impulses.

Driscoll and Aaron in an analysis of 160 cases of carefully followed peptic ulcer found that the "diet educational" plan with the proper timing of the administration of medicinal agents was the most successful for the treatment and prevention of peptic ulcer. ROBERT R. BIGELOW, M.D.

Allen, A. W.: Gastric Ulcer and Cancer. *Surgery* 1945, 17: 750.

The author is convinced that certain malignant ulcerations may behave like benign ulcer with regard to symptoms and response to conservative therapy for a variable period of time, only to manifest themselves as obvious cancer at a later observation. The differential diagnosis between malignant and benign ulcer of the stomach is often difficult or, in fact, impossible, by the diagnostic methods at our disposal, and radical surgery for localized cancer of the stomach which appears to be benign will result in a greater chance for cure than when it is done for a lesion which is obviously malignant.

A careful analysis of the data available for a ten-year period at the Massachusetts General Hospital,

Boston, showed that 14 per cent of the patients treated as having benign gastric ulcer proved to have cancer. These patients responded well to conservative therapy at first, losing their symptoms and regaining previously lost weight. Often the lesion appeared to diminish in size on roentgen and gastroscopic examinations. Occasionally, such an ulcer previously demonstrated by both methods was not recognizable after a month of treatment. It is difficult to explain the early behavior of some malignant ulcerations of the stomach. The improvement with regard to the symptoms and weight of the patient is easier to understand, since with bed rest and nonirritating foods, secondary inflammatory reaction is alleviated. Gastritis disappears and comfort replaces pain, gaseous eructations, nausea, and anorexia. The decrease in size of the ulceration may be due to the subsidence of inflammation about the ulcer. Possibly the crater may be leveled by granulation tissue or actually by cancer cells.

In order to arrive at a better diagnosis in the early malignant lesions, the author studied his records for common factors pertaining to this group of patients. Helpful information was derived from an analysis of the location of the lesion, the age of the patient, and the duration of his symptoms. Gastric analysis, particularly as regards free acidity and the size of the ulceration, was less valuable. Data concerning the type and radiation of pain, and the rate of healing with conservative therapy were of no value.

Ulceration in the immediate 2 cm. of stomach proximal to the pylorus is prone to be malignant regardless of the size of the lesion. This was true in 65 per cent of the author's cases. Nearly all ulcers of the greater curvature and the fundus of the stomach are cancer. Ulcers involving the anterior or posterior walls proved to be cancer in 20 per cent of the cases. Lesions of the lesser curvature and those of the pylorus itself showed malignancy in 10 per cent. Inasmuch as one-half of all ulcerations of the stomach originate on the lesser curvature, the author found that most of the diagnostic errors occurred with regard to the lesions of this region.

Patients with ulcerative lesions of the stomach after middle life having had symptoms of less than one year were five times more likely to have cancer instead of ulcer. If, on the other hand, patients in this age group had had symptoms for five or more years, the reverse was true. Every clinician should seriously consider any patient who appeals for advice about any digestive complaint that begins after the age of forty. The diagnosis of malignancy must be ruled out by all of the aids at our disposal. If an ulcerative lesion of the stomach is demonstrated, radical therapy should be instituted as soon as suitable arrangements can be made. It is in this type of lesion particularly, that palliative measures may confuse the true issue, and almost under our eyes an early curable cancer may become hopelessly inoperable.

The size of the ulcer may be misleading since cancer was present in 2 lesions that were less than 1 cm. in diameter. On the other hand, enormous benign lesions giving the clinical impression of unfavorable cancer have been encountered. We can only surmise that the lesion is benign if it is small in size, if it is in one of the safer zones, if it occurs in younger individuals, or if it is found in a patient with symptoms for many years.

Free hydrochloric acid was found with equal abundance in the "ulcer-cancer" group as in the group with definitely proved benign ulcer. Of a parallel group of patients proved to have cancer of the stomach, 60 per cent showed no free hydrochloric acid on gastric analysis. Therefore, the presence of free acid is of little help in the differential diagnosis. The absence of free acid, however, is definitely in favor of cancer.

Too much reliance has been placed on the amount of pain associated with gastric ulcerations. The common belief that pain indicates benign ulcer is erroneous. Many of the ulcers in the author's series that proved to be cancer produced pain that was relieved by food or alkalies in exactly the same manner as in the benign group. Even if an ulceration has apparently healed after one month of ideal hospital treatment, there should be a careful re-examination after four or six weeks. Any evidence of lack of complete healing or return of ulceration should be considered sufficient to warrant early surgery.

In the author's group of questionable lesions, it was found that when resection had been done on the diagnosis of benign ulcer only to have the pathologist find that the lesion was cancer, the five-year cure rate increased to 40 per cent. It is quite evident that the surgeon should include the nodal areas in his resections for all doubtful lesions. This adds little to the hazard of the operation and gives the patient his best chance for cure. It is also clear that we should more frequently make a wider resection. Often a simple total gastrectomy which lends itself to better elimination of the nodal areas than many subtotal resections can be done safely. This is true particularly when the lymph nodes in the region of the left gastric vessels appear to be involved. The great omentum can be safely eliminated and no serious sequelae have resulted from its absence.

One should not be tempted to do palliative surgery for gastric ulcer. In a group of 23 patients subjected to gastroenterostomy with or without cauterization of the ulcer, there were 4 who died of cancer of the stomach. This shows that even experienced surgeons cannot tell by the feel or the appearance of a gastric ulcer whether it is benign or malignant.

The author believes that early radical surgery is indicated when a patient appears for treatment with an ulcer of the stomach in the prepyloric or fundal regions. If he is over forty years of age and has had symptoms of less than one year, or if his ulcer is over 2 cm. in diameter, the same advice should be given.

If the patient is young and has a small lesion, or if the ulcer is superimposed on symptoms of more than five years' duration, a more conservative atti-

tude is justifiable. This patient should not be treated in an ambulatory fashion, as is common practice in milk or early duodenal ulcer, but should be given the benefit of an adequate hospital regimen. If the ulcer remains even partially unhealed after one month of such therapy, or if there is a return of ulceration one month after healing is apparent, then this patient should be urged to submit to surgery.

JOSEPH K. NARAT, M.D.

Schwartz, S. O.: Longevity with Metastatic Carcinoma of the Stomach. *Ann. Int. M.*, 1945, 22: 727.

There is considerable evidence that carcinoma of the stomach may manifest itself as a disease of marked chronicity. Subsequent to metastases (especially that of the bones), however, the downward course is accepted to be relatively rapid. For this reason operative procedures for the alleviation of the primary lesion are undertaken with reluctance when metastases are demonstrable. The author reports a case with metastatic carcinoma demonstrated in the bone marrow three years before death, to reopen for question the validity of extreme surgical conservatism in the presence of metastases.

The patient originally presented himself with the history of a peptic ulcer of nineteen years' duration, which had manifested itself by pain and bleeding. It is impossible to ascertain from the history when the transition from the benign condition to the malignancy had taken place. The 20-lb. weight loss antedating his admission by three or four months was the first clinical clue that significant change had taken place. It is improbable, however, that this would have been sufficient time for development of the metastases. The hematological findings on this admission were compatible with acute bleeding superimposed on chronic bleeding, without casting light on the nature of the underlying lesion. The absence of free acid and the presence of blood in the gastric contents, as well as the persistent occult blood in the stool, all suggested malignancy. It is significant that neither gastroscopic nor roentgenographic examination revealed the lesion even though its presence at this time was confirmed by the finding of metastases. It is also noteworthy that on a bland diet and replacement therapy (iron) the blood findings became normal within a relatively short period of time. Though details in the interval are unavailable, no radical change had apparently taken place during the two and one-half year period between the patient's first hospital admission and the reappearance of prominent symptoms, which, except those secondary to extensive bone destruction, were similar to the original. It is somewhat surprising that the blood should have remained at an adequate level in spite of episodes of bleeding and so marked a displacement of the bone marrow, and should have completely lacked the characteristics ordinarily associated with myelophthisic anemias.

A feature of considerable clinical interest is the transition from the benign to the malignant characteristics of the ulcer, a transition originally revealing itself clinically by extensive bleeding. At this time the lesion was so small (or so placed) as to be undiscoverable by either roentgen-ray or gastroscope examination, and yet it had already metastasized to the bones so extensively as to be cytologically demonstrable. Of much more importance was the benign course for a two and one-half year period following the demonstration of bone-marrow metastasis. This raises the question whether extreme surgical conservatism is justified in the presence of demonstrable metastases, when, otherwise, operative intervention might be indicated for the alleviation of symptoms. It would appear, at least from this singular case, that primary surgical procedures, when otherwise indicated, are justified even though early metastases are demonstrable. JOSEPH K. NARAT, M.D.

Appleby, L. H.: Postoperative Survival Periods in Gastrointestinal Carcinoma. *Canad. M. Ass. J.*, 1945, 52: 481.

Of 308 patients with carcinoma of the rectum, 204 were operated on and 82 of these left the hospital with a reasonable prospect of surgical cure. Twenty-one of the 82 have survived five years, but many more are still alive, a great many having been operated on within the last five years. Several are alive after ten years, and 1 patient has survived fourteen years and is in good health.

Of 327 cases of carcinoma of the sigmoid, 296 were explored. One hundred of these left the hospital with a prospect of cure. Fifty-four of these patients are still alive, 34 survived five years or more, and many of them much longer.

In 81 cases of carcinoma of the transverse and descending colon, the results have been poorer. Seventy-seven patients were explored and 36 survived resection. Of the latter, only 9 are known to be alive after five years.

Fifty-nine of 62 cases of carcinoma of the cecum and ascending colon were explored and 44 were resected. Thirty-one patients are known to be alive, and, of these, 24 have survived five years or more.

All 6 cases of primary carcinoma of the small intestine were operated on. Three, in the transverse part of the duodenum, were treated by a palliative short circuit. Three, in the mobile segments of the small intestine, were resected. Two of the patients are alive, one after six years, the other after seventeen months.

Only 193 cases of 684 of carcinoma of the stomach were explored. The other 491 cases offered no prospect of cure. Only 31 cases were resected with a prospect of cure. Twenty-four of the patients survived. The longest period of survival was eighteen months and the average period was eight and one-half months. Any operation, even exploration, in carcinoma of the stomach is dangerous. The mortality rate in resection of the stomach for cancer is 24.2 per cent; in resection for ulcer or other cause, it is 3.1 per cent. This difference in the mortality rate, in the hands of the same surgeon, must be intrinsic to the disease and not to the surgeon.

In carcinoma of the gastrointestinal tract, exclusive of the stomach, therefore, resection has a 36.6 per cent prospect of cure, and gives a 31 per cent chance of survival for over five years. There is little in these figures to inspire a feeling of despair.

SAMUEL KAHN, M.D.

Andersen, A. C., Slutzky, B., and Maertz, R. W.: Effect on Gastric Secretion of Pedicle Jejunal Grafts in the Wall of the Stomach. *Gastroenterology*, 1945, 4: 323.

The authors report that no inhibition of gastric secretory activity was observed following modification of the gastric mucosal surface through implantation of a portion of jejunum as a pedicled graft. In their hands the placing of jejunal pedicled grafts in the stomach wall has not inhibited the normal gastric secretion.

The animals used in this study were medium-sized mongrel dogs of both sexes maintained on a mixture of commercial dried dog food and meat scraps. Water was allowed at all times except during the last few hours of a fasting period and when the animal was being used in a study. Before being used the animal was fasted for twenty-four hours immediately preceding the test.

After determining the normal gastric secretory response of an animal under the conditions of the study, the animal was operated upon for the purpose of applying a pedicled jejunal graft to a surgically produced defect in the stomach wall. The dog was allowed to rest for at least three weeks before being again used in the study. At least fifteen separate gastric analyses were made on each animal after the operation. Sometime after the completion of the series, the animal was sacrificed and subjected to postmortem examination.

BENJAMIN GOLDMAN, M.D.

Marshall, S. F.: A Plan for the Surgical Management of Gastrojejunocolic Fistula. *Ann. Surg.*, 1945, 121: 620.

Interest in the serious problem of gastrojejunocolic fistula was stimulated by the high operative mortality reported in 1935 by Lahey and Swinton, who gave the immediate operative mortality as 63 per cent in 8 cases. In 1938 Lahey suggested a two-stage operative procedure in order to avoid the high operative risk. The first patient upon whom this plan was employed was successfully operated upon in 1938, after which the operative method was employed in 14 cases with 1 death, a mortality of 7.1 per cent.

Gastrojejunocolic fistula most commonly occurs following operation for duodenal ulcer and usually is the postoperative complication of a posterior gastroenterostomy. It is, therefore, important that when a posterior gastroenterostomy is employed the anastomosis should be made through an opening in the mesocolon, and placed near the base of the mesocolon, as far as possible from the colon. Most of these patients are in very poor condition. There is marked malnutrition with extreme alteration in the protein and blood chemistry, which makes any extensive operative procedure unsafe and unwise.

Experience has demonstrated that in order to prevent recurrence of ulceration in any complicated ulcer case, a radical subtotal resection of the stomach should be employed. In addition, the fistulous tract should be excised. However, an extensive block dissection of the fistulous tract in addition to a subtotal gastrectomy, undertaken in one stage, is entirely too hazardous and would certainly result in a high percentage of fatalities. The procedure used at the Lahey Clinic, Boston, consists of an operative plan in which the first stage is designed to prevent regurgitation of the small intestine and colonic contents into the stomach and jejunum. This has been used since April, 1938 at the Lahey Clinic. This is accomplished by dividing the terminal ileum and performing an ileocolostomy between the terminal ileum and the descending colon. Following this, the contents of the small intestine and right colon are emptied into the descending colon and they cannot re-enter the stomach and jejunum. Subsequent to this first-stage procedure the patients have tended to gain in weight, and in most instances have a complete cessation of the diarrhea. The patients are now sent home for two or three months after which the second-stage procedure may be done when the state of nutrition and general condition are improved.

In the second stage, the cecum, right colon, and transverse colon are mobilized to a point distal to the colonic fistula. All mesenteric attachments are divided. The transverse colon beyond the fistula is then divided between clamps and the end of the distal portion of the transverse colon is inverted with catgut sutures. The colon with the attached stomach may then be turned forward and the involved loop of jejunum is visualized and likewise resected. A high resection of the stomach after mobilization and division of its attachment complete the block excision of the fistulous tract and involved viscera. An end-to-end jejunal anastomosis is carried out prior to completion of the gastrojejunal anastomosis.

All of these patients have been operated upon without shock and the convalescence has been relatively uneventful after such an extensive resection.

SAMUEL J. FOGELSON, M.D.

Glaessner, C. L.: Disturbances in the Sugar Metabolism after Subtotal Gastrectomy. *Am. J. Digest. Dis.*, 1945, 12: 157.

The absorption of sugar in men and animals normally takes place in the small intestine, since the stomach is quite unable to absorb either water or glucose. The process of absorption by the small intestine is very complicated. Experimentally it has been found that: (1) sugar is absorbed in a selective way, and (2) the absorption of sugar does not follow the simple laws of diffusion.

In normal individuals, the stomach controls the volume and concentration of the food which enters

the duodenum and when this mechanism is destroyed by a surgical intervention, we find changes in the absorption of sugar through the wall of the intestine.

The author's experiments in 14 patients after subtotal gastrectomy showed that the administration of 100 gm. of glucose in a 30 per cent solution, introduced directly into the jejunum, caused a rapid hyperglycemia with characteristic clinical signs: nausea, vomiting, headache, cramps in the abdomen, coma, and nystagmus. Even patients showing hypoglycemic figures in a fasting condition revealed a very marked hyperglycemia after the administration of glucose. Different sugars worked in different ways. Glucose and sucrose provoked hyperglycemia; levulose was entirely indifferent. In cases of marked hyperglycemia the intake of sugar (glucose and sucrose) provoked attacks of nausea, vomiting, wide pupils, pain in the lumbar region, and lowering of the blood pressure; these are signs of shock. The attacks developed twenty minutes after the administration of glucose or sucrose, at the same time that the hyperglycemia set in. The fact that the levulose did not provoke such attacks could be easily explained by the slow absorption of levulose and the lack of hyperglycemia after the administration of this sugar. The attacks were never observed without hyperglycemia. The author proposes to name such shock "hyperglycemic shock."

Another interesting observation was made; i.e., the attacks could be prevented by the administration of insulin, and patients suffering from these disorders after gastrectomy were advised to take small amounts of insulin (from 5 to 10 units) before meals; in this way attacks were completely avoided. Observations made during the hyperglycemic shock revealed disorders of the vascular system, such as increase of the pulse rate, and decrease of the systolic, and especially of the diastolic, blood pressure. In a few cases a comatose condition—disorientation and soft eyeballs—could be observed.

JOSEPH K. NARAT, M.D.

Griswold, R. A.: Transthoracic Gastrectomy for Unusual Lesions of the Stomach. *Ann. Surg.*, 1945, 121: 600.

Until recent years, tumors of the cardia which extended up to the esophagus, and tumors of the lower esophagus whichinvaded the proximal stomach were considered inoperable, but within recent years reports on a transthoracic approach for these tumors have been increasingly frequent. The advantages of this transthoracic approach are the more direct accessibility and better exposure of the involved structures within the abdomen; which make it possible to deal with extensions of the tumor into the diaphragm and lower esophagus. The disadvantages are (1) the possibility of infection of the mediastinum and pleura, and (2) the somewhat longer operating time.

With improvement in the technique, avoidance of contamination, and meticulous attention to the details of anastomosis, the danger of resection has been reduced. The prophylactic use of the sulfonamides and penicillin has been proved of value. Gentleness, good hemostasis, and adequate maintenance of the blood volume, combined with expert anesthesia all contribute in making the operating time of little importance.

For the operation the patient is supported on the right side; an incision is made over the eighth, ninth, or tenth rib, varying with the obliquity of the ribs; the rib is then resected from the angle to the costal margin. The thorax is then explored and the mediastinal lymph glands are palpated for evidence of metastasis. The lung is packed away into the upper chest, and the phrenic nerve is crushed low at the side of the pericardium to immobilize the diaphragm and prevent postoperative tension on the suture lines. The mediastinal pleura over the esophagus is incised forward as far as may be necessary and the incision is then carried across the diaphragm from the esophageal hiatus to the costal margin. Following this the abdomen is explored for metastasis and the operability is determined. A routine splenectomy is done to increase the exposure and facilitate the rest of the procedure. The vagus nerves are next divided above the diaphragm. Following this the dissection is carried out retroperitoneally if there is involvement of the posterior wall of the stomach. The lesser curvature is next freed along the entire gastrohepatic omentum. The stomach and lower esophagus are now mobile and may be lifted to the surface of the thorax. Then the stomach is divided between the clamps with a cautery as low down as is necessary to get well below the tumor. It has been possible to perform a total gastrectomy with this exposure and the jejunum has been utilized for subsequent anastomosis. Usually, however, a considerable portion of the stomach may be left.

Following closure of the stomach in two layers of interrupted fine silk inverting sutures, the tip of the greater curvature is sutured to the posterior thoracic wall to reduce the tension on the subsequent suture line. The esophagus is then divided between the clamps, following which it is sutured to the anterior surface of the stomach for a distance of about 1 inch to minimize the tension, then an opening is made in the anterior surface of the stomach equal in length to the diameter of the esophagus and an open anastomosis is done in two layers with fine silk sutures. The anastomosis may be reinforced with any available tags of omentum. The margins of the diaphragm are then sutured to the stomach, well down from the anastomosis so that there will be no pull on the suture line. The remainder of the diaphragm is overlapped a distance of about 1 cm. and closure is done with mattress sutures of interrupted silk.

Three such cases of transthoracic gastrectomy are reported. In 1 case the cardia was anastomosed to the stump of the stomach, and in the other cases an esophagogastrostomy was carried out.

SAMUEL J. FOGELSON, M.D.

Gray, I.: Trauma in Relation to Peptic Ulcer. *N. York State J. M.*, 1945, 45: 887.

The author states that experimental work on animals reported by various authors would indicate that direct trauma over the region of the stomach can be followed by the presence of acute peptic ulcer. Case histories are presented in which acute peptic ulcers, perforated gastric ulcers, and perforated duodenal ulcers were due to trauma. Other cases are presented in which pre-existing peptic ulcers were aggravated by injury, as revealed by routine activities or aggravated by occupational factors.

From the cases cited, the author concludes that acute peptic ulcer may follow direct injury to the upper abdomen. There is evidence to indicate that complete healing of an acute ulcer can and does occur. Death may follow when the tear or bruising of the mucous membrane is associated with erosion of the arterial vessels. Injury to the gastric mucous membrane or submucosal hemorrhages may occur with consequent digestion of the injured part. The extent of the pathological process in the gastric wall is the determining factor in relation to the complications that may arise.

The question as to whether or not a single trauma such as a direct blow to the epigastrium can produce a chronic ulcer of the stomach and duodenum is a debatable subject. It has been estimated that about 5 per cent of the adult population have or have had a gastroduodenal ulceration. In some of these individuals the ulcer may possibly be dormant or latent. In view of the fact that the mucous membrane of the stomach regenerates rapidly and that clinical experience shows that ulcer may exist without symptoms, any assumption that a single, direct blow can cause chronic peptic ulcer is entirely hypothetic.

Liniger and Molineus have specified the following postulates that must be fulfilled before trauma can be held as the cause of ulcer: (1) proof must be present of the absence of gastric disease prior to the accident; (2) the trauma must be severe and localized to the epigastric region; (3) the onset of symptoms must be immediate; and (4) the symptoms and signs that follow must point to gastric ulcer.

Peptic ulcer may exist without any clinical symptoms whatsoever. Perforation or hemorrhage may be the first symptom or sign of chronic peptic ulcer. The effect of trauma in any given case can only be evaluated after a thorough analysis of the history of the condition and a complete examination of the patient.

HERBERT F. THURSTON, M.D.

Paul, M.: Stenosis of the Small Intestine from the Cicatrization of Isolated Inflammatory Lesions. *Brit. J. Surg.*, 1945, 32: 371.

Five cases of obstruction of the small intestine due to stricture are reported. As the contents of the small intestine are fluid, considerable narrowing occurs before symptoms are produced, and it is debatable whether or not an isolated inflammatory lesion of the small intestine could produce symptoms apart from those of stenosis. In most cases exact diagnosis of the cause of the stenosis is impossible before operation.

The stenosis in 4 of these cases was found to be due to tuberculous stricture, and in 1 case it was due to Crohn's disease. All of the patients were Singhalese males. At laparotomy the findings were typical of obstruction, and in some of the cases the gross appearance of the stenotic area indicated the pathological basis for the stricture. A tuberculous ulcer causes a scar which spreads circumferentially around the bowel, and small tubercles may be seen on the peritoneal surface. Other scars may be visible. Crohn's disease is more likely if there is involvement of an appreciable segment of bowel, but this condition might be confined to a small area. The histological diagnosis of Crohn's disease is made by exclusion, in the absence of tuberculous granulation tissue or malignant change.

Operative relief of stricture of the small intestine is obtained by short-circuiting the stricture by means of lateral anastomosis, and when a stricture represents a scar of a healed, past infection such treatment will cure the patient with the minimum risk. When there is a possibility that the stricture is of malignant origin or is associated with active inflammatory disease, resection and anastomosis are indicated.

JOHN L. LINDQUIST, M.D.

Koch, V. W., and Fischer, W. A.: Duodenal Ulcer with Perforation following a Cutaneous Burn. *Ann. Int. M.*, 1945, 22: 719.

Although duodenal ulcers following burns have been described previously, the term "Curling's ulcer" has been adopted largely because Curling's collection of cases was the largest yet published, and because his original paper described lesions occurring specifically in the duodenum, the site of the great majority of reported cases.

Statistics vary greatly as to the incidence of duodenal ulcers following burns. An exhaustive review of the literature by Harkins led him to the conclusion that the average 3.8 per cent is probably near the correct figure for the incidence of ulcers following burns. These ulcers are most common in children, the average age in Curling's series being ten and eight-tenths years. The ulceration may occur at any time following the burn. Instances of ulceration occurring as early as eighteen hours and as late as one hundred days have been reported.

The cause of "Curling's ulcer" is still awaiting experimental proof. The theories which have been advanced are limited only by the number of observers. Those receiving the most support are:

1. "Curling suggested that Brunner's glands were called upon to perform the excretory functions for which the burned skin was incapacitated."

2. The toxic theory assumes that a toxin is carried to the intestines by the blood.

3. McLaughlin's experimental work of partially damaging the adrenal glands of 21 dogs produced ulceration in the small bowel of 17 of them, but no ulceration of the stomach was observed.

4. The embolic theory that the infarcted area becomes necrotic and falls away is said to have been supported by Billroth. Others, however, have called attention to the fact that emboli never occur in the duodenum without occurring also in the stomach, and point out also that the obstructed vessel has never been found.

5. The subsequent development of duodenal ulcers following infection of the burned area has been noted by many.

6. Necheles and Olson conclude from the experimental work that compounds of the nature of acetylcholine may be liberated by the burn or that the acetylcholine-splitting esterase may be inhibited by the burn.

Duodenal ulcers following burns are generally single, but may be multiple. Their location varies. The ulcers vary in size from that of a pinhead to a quarter. The amount of tissue lost may be great or slight, as in some cases the lesion is but a mere erosion, whereas in others it is a rapidly sloughing, perforative process. The shape of the ulcer is irregular and dentate, or long and narrow, occasionally circular. The edges are sharply and cleanly cut, the base is clean and grayish, and there may not be much inflammation at the margin. It is frequently funnel-shaped because of a loss of more mucous membrane than of muscle tissue. The outcome is perforation, hemorrhage, or spontaneous healing.

The authors report a case of Curling's ulcer in a sixty-eight-year-old-man, which is of particular interest because of the fact that the burn was not of great extent; because there were no premonitory symptoms of the developing ulcer; and because of the diagnostic difficulties encountered due to previous cardiac and gall-bladder disease. The first signs, in the form of nausea and emesis, appeared on the twenty-third day after the burn. The clinical picture appeared to be that of acute cholecystitis, a coronary attack, or a perforated viscus. The patient expired three days later.

The autopsy revealed a punched-out round hole, 5 mm. in diameter, of the anterior, superior aspect of the duodenum, just about at the junction of the pyloric sphincter and extending through all coats of the intestine. The ulcer showed no inflammation and little evidence of fibrosis and scarring. About ½ inch distally, there was another area of superficial scarring with an inflammatory margin about 5 mm. in diameter.

JOSEPH K. NARAT, M.D.

Rienhoff, W. F., Jr.: An Analysis of the Results of the Surgical Treatment of 260 Consecutive Cases of Chronic Peptic Ulcer of the Duodenum. *Ann. Surg.*, 1945, 121: 583.

This report is based on 260 patients operated upon by the author, who used an operative technique "which was based on certain anatomic and physiological considerations that combine safety and efficacy, in a higher degree than the more conservative and also the more radical procedures." All of the patients were private ones and they were contacted every six months to determine their then present condition. In no instance did any patient fail to report.

The rationale of the operative technique was

1. To remove the most active portion of the stomach from the standpoint of contractility, namely, the pyloric antrum and the fundus up to the incisura angularis. By this procedure the acid-stimulating portion of the gastric mucosa in the pyloric antrum as well as from one-third to one-half of the acid-secreting mucosa of the fundus was excised. This removal of the mucosa in the pyloric antrum "takes away" the gastric hormone "gastrin," which is a major factor in the stimulation of gastric secretion.

2. To re-establish the continuity of the gastrointestinal tract by an antecolic gastrojejunostomy with a large stoma.

3. To induce free irrigation of the remaining gastric segment with the alkaline duodenal secretions by means of this Polya type of anastomosis and produce a maximum neutralization of the gastric contents.

4. To divert the flow of gastric contents from the ulcer-bearing portion of the duodenum into the jejunum.

This conservative resection followed by the antecolic gastrojejunostomy has a lower immediate mortality and facilitates any further surgical procedures which may be necessary as the result of postoperative complications. The author apparently does not believe that it is necessary to perform a radical routine resection on all patients with peptic ulcer of the duodenum because "all but a relatively small percentage of the cases are satisfactorily treated by conservative resection with a lower immediate mortality."

The operative technique consisted of a midline incision to locate the common duct at its point of disappearance behind the upper part of the second portion of the duodenum. The left gastric vessels and the right vagus nerve were divided; then the vessels in the gastrohepatic and gastrocolic ligaments as well as the duodenohepatic and duodenocolic ligaments were "individually clamped and ligated with "c" silk." The segment of the stomach to be removed was next clamped with two Payr clamps, then the pyloric antrum, pyloric sphincter, and a portion of the fundus of the stomach were removed. The stump of the duodenum was closed with two layers of sutures and the first suture was a continuous one with "O" chromic catgut. After the first suture was in place the crushed tissue together with the clamp was removed. The second row of sutures were interrupted Halsted sutures of fine "a" silk which inverts the first continuous suture line. As a rule they were started medially and continued laterally. Because of the relatively small segment of stomach removed, a short-loop antecolic gastrojejunostomy could be readily performed without the need of an enteroenterostomy. This was so short that after suture of the intestine to the end of the stomach the distance between the ligament of Treitz and the beginning of the gastrojejunal anastomosis at the lesser curvature was "only three fingers' breadth."

The results showed that 204 patients, or 78 per cent, should be regarded as well; 30 patients, or 12 per cent, have been benefited; and 8 per cent were not benefited. The immediate mortality was 2 per cent with no deaths occurring in the last 160 patients.

In summary, gastric resection is considered the best method available at present for the treatment of the complications of chronic peptic ulcer of the duodenum. It is not ideal, but it is relatively better than less extensive surgical procedures.

This report was made in order to serve as a basis for further comparison and study. It has evolved from a search for a surgical procedure which combines in the highest degree both safety and efficacy.

SAMUEL J. FOGELSON, M.D.

Hollander, F., Rosenak, S., Colp, R., and Karelitz, R. F.: A Synthetic Predigested Aliment for Jejunostomy Feeding. *Surgery*, 1945, 17: 754.

Jejunostomy is used (1) as a palliative procedure for feeding patients in whom oral feedings are either difficult or impossible, such as patients with inoperable obstruction of the esophagus or stomach caused by acute inflammations or malignancies, or patients with inanition caused by pernicious vomiting of pregnancy; (2) as a preliminary procedure in the treatment of extensive gastroduodenal and gastrojejunal ulceration accompanied by marked evidence of alkalosis and refractory to medical treatment; (3) as a prophylactic measure for the relief of certain postoperative complications following surgery of the stomach, such as gastric dilatation and duodenal fistula arising from suture insufficiency—the jejunostomy being complementary (made coincidentally with the major operation) or supplementary (made subsequently to the operation); and (4) as a definitive procedure for primary gastroduodenal ulcer and for marginal ulcer secondary to gastroenterostomy—a use which was in vogue for a time, but has since lost its popularity.

When jejunostomy was first employed, it was accompanied by certain postoperative complications: the loss of intestinal contents through incompetence of the jejunal stoma, the persistence of a jejunal fistula after withdrawal of the enterostomy tube, and the frequent occurrence of intestinal obstruction due to technical imperfections associated with the Witzel type of jejunostomy. These difficulties have since been obviated by improvements in the surgical technique. Another reason for the unpopularity of jejunal alimentation was the distention, nausea, vomiting, cramps, diarrhea, and enteritis which frequently accompanied it. It has been generally accepted that these distressing gastroenteric symptoms may be caused either by physical factors or by a group of distinctly chemical ones. The milder of these symptoms have been clearly associated with physical factors like the temporary engorgement of the small intestine with food material. These are easily prevented by control of the rate of drip administration, with either an efficient drip apparatus or a motor-activated pumping device. The importance of unemulsified fat in this connection is particularly marked. An excessively high osmotic pressure may also be a contributing factor to jejunal irritation, since it will require considerable time for the small bowel to dilute the aliment sufficiently to prevent osmotic stimulation of the neuromuscular mechanism.

For jejunal feeding, the aliment must be very easily digestible, or even predigested. This is necessary because salivary and gastric digestion are completely eliminated, and pancreatic and intestinal digestion are decreased, the latter as a consequence of the decreased stimulation of the corresponding glands and the reduced time of contact of these secretions with the aliment. Extensive predigestion is important also for a maximum of absorption. Any factors which may irritate the bowel must be excluded from an enteric aliment. Its *p*H should be about 6.0. Its osmotic pressure must not be too much above isotonicity, since the reduction in this property which normally results from dilution with the digestive secretions after oral feeding is great in jejunal alimentation.

To eliminate the aforementioned drawbacks of jejunostomy feedings, the authors suggest a new formula for a synthetic predigested aliment. In contrast with previous formulas, emphasis is laid upon the incorporation of predigested proteins, the marked reduction in the fat content, the use of partially predigested carbohydrate free of hexose sugars, and the liberal supply of essential salts and vitamins. Evidence for the efficacy of this nutrient mixture is based on increase in body weight and absence of cramps and diarrhea, specifically associated with its administration to experimental animals and patients with jejunostomy. Furthermore, it has been shown that the occasional occurrence of untoward symptoms like nausea, vomiting, and distention can be eliminated by starting the rate of feeding at 60 c.c. per hour and gradually increasing it to a maximum of from 150 to 200 c.c. per hour about the fifth postoperative day, the speed of increase and the upper limit being established for each patient individually.

The importance of sterilization of the aliment and the drip apparatus is discussed.

JOSEPH K. NARAT, M.D.

Morgan, C. N.: Wounds of the Colon. *Brit. J. Surg.*, 1945, 32: 337.

This study is an analysis of 128 war wounds of the colon, mainly in survivors. The right, transverse, and left colon appear to have been injured with equal frequency. The fixed portions of the colon were most commonly injured by missiles entering from the back, whereas the cecum and transverse colon were usually injured from the front. Of 56 patients with penetrating wounds of the colon surviving for twenty-eight days or longer, over one-third were operated upon after a time-lag of more than twelve hours, one-seventh after a time-lag of more than eighteen hours, and one-eleventh recovered after a preoperative delay of twenty-four hours. This indicates that in late

cases surgery may produce good results more often than is generally realized. Among survivors operated upon within six hours there was a preponderance of those with injury to the transverse colon, whereas among those operated upon in the second six-hour period there was a marked fall in the number of survivors following injury to this segment. This is due probably to the frequency of severe hemorrhage from the wide expanse of vascular mesentery, mesocolon, and omentum, and from injury to other abdominal organs. The better blood supply of the proximal colon and the frequency of other abdominal injury increase the risk in injuries to these segments, while the greater virulence of the contents of the descending colon, and the difficulties of mobilization and exteriorization of the latter, increase the risk in wounds of the left colon. In uncomplicated wounds penetrating the abdomen, shock is synonymous with internal hemorrhage, and the wounded die in the first few hours from hemorrhage and shock. This indicates the function of the resuscitation units, first, to make the wounded fit for operation by transfusion and, second, to maintain fluid and salt balance during convalescence.

In regard to operative treatment of the injured colon, exteriorization of the damaged portion, when possible, is the safest procedure. Although it is better to bring the gut out through the skin, in urgent cases with a short loop, extraperitonealization may be achieved by suturing the injured colon to the parietal peritoneum and leaving the abdominal wound only partially sutured.

When the condition of the patient is such that the risk of mobilization is too great, closure of the perforation with two layers of sutures and complete exclusion of the segment by a proximal colostomy is the next best method. The colostomy must have a good spur and should be established as near the lesion as possible. The sutured area should be drained thoroughly.

When the lower third of the pelvic colon has been injured, adequate exposure and suture are difficult, so that drainage and proximal colostomy alone may have to suffice. A grossly bruised and devitalized area of bowel should also be treated as a penetration. Extraperitoneal perforation of the fixed portions of the colon must not be overlooked and should be treated by mobilization for inspection, suturing of the perforation, and closing off the area from the peritoneal cavity by suture of the bowel to the parietes with the provision of good drainage. When a large segment of colon has to be resected, primary anastomosis is unsound, and the two colonic stomas should be brought out independently at the most convenient sites. However, after removal of a hopelessly damaged right colon, a lateral ileotransverse colostomy, which leaves the proximal end of the transverse colon open as a terminal colostomy, may be justifiable. .

The complications following various operative procedures and the closure of the colostomy are discussed.

JOHN L. LINDQUIST, M.D.

Cave, H. W.: Surgical Experiences with Ulcerative Colitis. *Surg. Clin. N. America*, 1945, 25: 301.

The object of this presentation is, first, to discuss certain impressions and, second, to give some detailed technical suggestions and warn of the pitfalls which may be encountered in the treatment of ulcerative colitis. The author bases his statements on his experiences with 92 patients upon which he performed operation. These 92 individuals underwent 163 operations with 18 deaths, an operative mortality of 19.5 per cent.

In the first two years of this work there were 15 emergency operations in the acute fulminating stages of the disease, with 8 deaths, an operative mortality of 53 per cent. The first lesson learned was that this type of case should not have a diversion of the fecal stream because of the debilitation due to massive hemorrhages. Later, 50 ileostomies were done with 4 deaths, an operative mortality of 8 per cent. In addition, there were 46 subtotal colectomies with 5 deaths, an operative mortality of 10.8 per cent; 9 partial colectomies with 1 death, an operative mortality of 11 per cent; and 8 ileosigmoidostomies and 11 combined abdominoperineal resections with no fatalities. It is important to know that medical treatment has proved inadequate when the process has reached the stage of irreversibility. Earlier diversion of the fecal stream, when the disease is of the variety that will proceed to intractability, should be employed more frequently. However, it is difficult to differentiate the types of the disease in its incipiency.

The indication for emergency surgery is impending perforation. Massive hemorrhage will be treated more successfully by the physician with transfusion and antispasmodics than by the surgeon, particularly in the acute phases. There are two distinct groups of patients who should come to surgery early: (1) those who have extensive pathological changes, and (2) those in whom the disease shows periods of activity and remissions, but in whom the trend is downward. The latter type of patient could be spared a prolonged illness and loss of colon if ileostomy were performed at the earliest phase of the disease, provided one is certain that the disease is progressive and cannot be managed medically. Ileostomy is much more of a risk than subtotal colectomy. In 65 ileostomies there were 12 deaths, a mortality rate of 18 per cent. A notable fact is that so many of these patients, following ileostomy and subtotal colectomy, have remained well without proctectomy. The ideal plan of treatment for a patient with a far advanced lesion involving the entire colon and rectum is, first, an ileostomy and then a subtotal colectomy with, finally, if the patient has not gained satisfactorily in weight and there is a persistent bloody discharge from the anus, removal of the rectum.

The ileostomy can be best carried out through a McBurney's incision with division of the ileum approximately 6 inches from the ileocecal valve. The distal divided end is brought out through a stab wound in the anterior abdominal wall 2 inches below the umbilicus and just to the left of the midline.

The proximal divided end is brought out of the lower angle of the McBurney's incision, and great care is exercised in suturing the cut mesentery to the peritoneum on the undersurface of the anterior abdominal wall in order to prevent prolapse of the ileal stoma. The ileum is also sutured to the peritoneum with No. 0000 plain catgut on a fine atraumatic needle.

The second stage of the surgical procedure for the cure of ulcerative colitis is subtotal colectomy. This means removal of the last 6 inches of the terminal ileum, of the cecum and of the ascending, transverse, and descending colon, as well as most of the sigmoid down to approximately 6 inches above the peritoneal reflection. This is done through a left paramedian incision from the level of the xiphoid cartilage down to and including the previous mucous fistula of the distal divided ileum and down to 3 inches below this point. The most difficult part of subtotal colectomy is mobilization of the splenic flexure and division of the splenocolic ligament. No attempt should be made to close the distal divided end of the colon and drop it back into the peritoneal cavity, but the distal colon is pulled taut upward out of the pelvis so that it protrudes from 2½ to 3 inches above the anterior abdominal wall. The lower divided sigmoid should be sutured to the peritoneum and the anterior abdominal wall in order to prevent a possible intestinal obstruction by a loop of small bowel pushing its way through the lower bowel segment and the lateral peritoneal wall.

SAMUEL J. FOGELSON, M.D.

McPherson, A. G., and Kinmonth, J. B.: Acute Appendicitis and the Appendix Mass. *Brit. J. Surg.*, 1945, 32: 365.

This article analyzes 730 cases of acute appendicitis treated in St. Thomas's Hospital from 1937 to 1942, and makes a comparison with two similar analyses from the same hospital made over a forty year period. Particular attention is drawn to acute appendicitis with mass formation. There is little reference to the term "appendix mass" in the literature, and frequently it is confused with the term "appendix abscess." By "appendicitis with mass" the authors mean a clinical condition in which there is, in addition, to the signs and symptoms of acute appendicitis, a mass in the right iliac fossa which is palpable without anesthesia. Some of these masses may contain some pus or become frank abscesses, while others consist of an inflamed appendix walled off by inflamed and edematous omentum, mesentery, and coils of bowel. The authors believe that the presence of a mass indicates an attempt on the part of the peritoneum to localize the infection, and if this attempt appears to be succeeding, the case is treated conservatively. The clinical findings rather than the length of the history decide the management. Early cases are treated by immediate operation, and when there is evidence suggesting a spread of infection, or frank, diffuse peritonitis at the time of admission, operation is advised. This conservative treatment is not to be confused with the Ochsner method of treatment which is applied to cases with general peritonitis.

Patients with a mass are put to bed in low Fowler's position; no sedatives, enemas, or aperients are allowed; fluids in small amounts only are given by mouth; and the half-hourly pulse rate is charted. Indications for abandoning conservative treatment are: a rising pulse or persistently elevated pulse rate; increasing signs and symptoms suggesting a spread of infection; abscess formation (at a later stage), and very occasionally, a failure to resolve. Conservative treatment is not advised for children, the aged, or in pregnancy unless a very firm and localized mass is present on admission, and this is uncommon in these types. Interval appendectomy, three months after resolution of the mass, is recommended for those cases which have responded to conservative treatment, unless age or the general condition of the patient is a contraindication.

There were 511 cases of simple acute appendicitis, 90 with diffuse peritonitis, and 129 with a mass. The mortality rate in simple appendicitis was 1.7 per cent, in contrast to 15.6 per cent in cases with diffuse peritonitis. Only 1 patient in whom a mass had been felt before operation died, which gave a figure of 0.8 per cent. No deaths followed interval appendectomy. Conservative treatment was abandoned in 31 cases. The time spent in the hospital averaged twelve and six tenths days in simple appendicitis, thirty and three tenths days in general peritonitis, and thirty-two and nine tenths days for the mass cases returning for interval appendectomy. It is significant that although a longer hospital stay is required in the mass cases, only 1 of these patients died, and this death followed operation for appendical abscess. The lowest mortality occurred in the mass cases despite the fact that the average history was longer, a factor which was believed to raise the mortality. The percentage of nonfatal complications was also smallest in the mass cases. The mortality rate for the entire series of 730 cases amounted to 2.9 per cent.

JOHN L. LINDQUIST, M.D.

Aycock, T. B., and Farris, E. M.: Appendicitis; The Possible Effects of Sulfonamides on Mortality. *Ann. Surg.*, 1945, 121: 710.

The authors' report of ten years of experience with acute appendicitis in a municipal institution is presented. Six hundred and fifty-one patients were operated upon during the first six-year period, and without the routine use of the sulfonamides when perforation had occurred. During the subsequent four-year period 500 patients were operated upon, and sulfonamides were administered topically at the time of operation if perforation existed. Following the operation sulfathiazole was given orally in nearly all of such cases. The mortality rate was lower in the latter group.

Further clinical and experimental studies are necessary in order to determine the value of these observations.

JOSEPH GASTER, M.D.

Holland, C. A.: Multiple Carcinomas. *J. Am. M. Ass.*, 1945, 128: 356.

Multiple primary malignant growths should now not be considered pathological curiosities and remarkably rare because their incidence varies from 3.34 to 4.33 per cent. The case reported presented a carcinoma of the breast in August, 1933, and a carcinoma of the esophagus in June, 1939, at which time the patient also had a small basal-cell carcinoma of the left cheek. In June, 1942, an annular carcinoma of the hepatic flexure was found, and, at present, twenty-eight months after the removal of the fourth carcinoma, the patient is without physical or roentgen evidence of any malignant disease.

SAMUEL J. FOGELSON, M.D.

LIVER, GALL BLADDER, PANCREAS, AND SPLEEN

Kelsey, M. P., and Comfort, M. W.: Occlusion of the Hepatic Veins; A Review of 20 Cases. *Arch. Int. M.*, 1945, 75: 175.

Occlusion of the hepatic veins was an incidental finding in 16 of the 20 cases reported by the authors; in the remaining 4 it played a major role in the illness. The occlusion in all cases was due to thrombosis. Occlusion of the hepatic veins may be primary or secondary to inflammatory, cirrhotic, or neoplastic diseases of the liver, to thrombosis of the neighboring vena cava, to diseases in which thrombosis occurs frequently, such as polycythemia vena, and perhaps the slowing of the circulation in debilitating diseases. While it often is merely an incidental observation at autopsy, it should be suspected when an acute painful episode with shock occurs during an otherwise chronic course of hepatic disease.

In cases of acute occlusion of the hepatic veins as well as in acute terminal episodes of the chronic form of the disease, the rapidity of increase in the size of the liver together with evidence of profound disturbances of hepatic function and of portal obstruction (which could be caused only by some rapidly developing process such as thrombosis) may well suggest the correct diagnosis.

Acute occlusion of the hepatic veins has been confused with acute pancreatitis, but normal serum amylase findings along with a rapidly enlarging liver and the rapid development of portal obstruction rules out the pancreatic lesion. EARL O. LATIMER, M.D.

Aspray, M.: Calcified Hemangiomas of the Liver. *Am. J. Roentg.*, 1945, 53: 446.

The author reports a case of calcified hemangiomas of the liver in which on roentgen examination of the abdomen extensive circumscribed calcified shadows were demonstrated in the region of the gall bladder. Within this circumscribed area streaks of calcification seemed to radiate out from the center. The impression was that of a benign neoplastic involvement of the liver, possibly hemangiomas. Autopsy findings later confirmed this diagnosis.

EARL O. LATIMER, M.D.

Smith. B. C.: Acute Cholecystitis; The Surgical Treatment of 332 Cases. *Surg. Clin. N. America*, 1945, 25: 285.

The author has reviewed 332 cases of acute cholecystitis. The ratio of females to males was 2 to 1. Cholecystectomy was performed on 223 patients with a mortality rate of 3.5 per cent, and cholecystostomy was performed on 103 patients with a mortality rate of 11.6 per cent. Two hundred and thirty-nine patients (70 per cent) were observed for a period ranging from one day to five weeks after admission before operation; 24 of these died, which gave a 10 per cent mortality rate. Ninety-two cases (30 per cent) were operated upon on the day of admission with a mortality rate of 5.4 per cent. Cultures were taken in 228 cases; 20 per cent were reported as presenting "no growth;" the bacillus coli was found 70 times, the streptococcus viridans 23 times, the bacillus welchii 10 times, the hemolytic streptococcus 5 times, the staphylococcus aureus 7 times, the pneumococcus 3 times, the hemolytic bacillus subtilis 8 times, and the typhoid bacillus 7 times.

There were 24 deaths, a mortality rate of 7.2 per cent. One death occurred without operation. Twenty deaths occurred in patients over fifty years of age. Twenty per cent of the patients had either gangrene or perforation, or perforation with abscess. Seven patients died of acute pulmonary complications, and 5 with cardiac, and 2 with renal complications. One patient died of a sepsis due (according to the author) to an infection of the operative field which had been caused by a clamp that had slipped off the cut cystic duct. Two patients died of pulmonary emboli and 1 patient survived this complication. One died of apoplexy and 2 patients succumbed to hyperpyrexia.

Fever, rapid pulse, leucocytosis, a tender mass in the right upper quadrant, and muscle spasm are indications for such treatment as is consistent with the patient's condition. One patient may have to be content with cholecystostomy as a life-saving measure. Secondary cholecystostomy should be done as soon as the patient's condition permits. Advanced disease elsewhere in the body may necessitate acceptance of cholecystostomy as the only surgical therapy possible.

If the clinical course of the patient does not improve in twelve hours, surgery or more rigid medical vigilance is indicated. Failure to improve in twenty-four hours calls for surgical intervention. Improvement under medical management permits the delay of surgery. EARL O. LATIMER, M.D.

McGuigan, W. J.: Acute Cholecystitis. A Comparative Study of the Mortality Rate after Immediate and Delayed Operations. *Am. J. Surg.*, 1945, 68: 219.

One hundred and twenty-three patients with acute cholecystitis have come to operation at the Hazelton State Hospital of Hazelton, Pennsylvania during the past decade. There were 98 females and 25 males;

their ages varied from twenty-one to seventy years, the average age being forty-six and one-half years. All received essentially the same preoperative treatment: morphine hypodermically, an ice cap to the abdomen, and parenteral infusions of glucose solutions to combat dehydration and fortify the liver. The postoperative management of all was also similar: morphine for pain and glucose solutions to maintain the water balance and to supply sugar to the liver.

For the purpose of comparative study this material was divided into six groups according to the length of time elapsing between the onset of the symptoms and the operation, group I comprising those coming to operation within forty-eight hours after the onset of the attack, group II those coming to operation between forty-eight and seventy-two hours, group III between seventy-two and ninety-six hours, group IV between ninety-six and one hundred twenty hours, group V between one hundred twenty hours and seven days, and group VI between eight and ten days. These groups comprised, respectively, 22, 17, 20, 24, 23, and 17 patients. Seventy-two hours was arbitrarily chosen as the dividing point between the immediate operation (within seventy-two hours), and the delayed procedure (after seventy-two hours).

Under these conditions the operative mortality of the first two groups, that is, up to seventy-two hours was 13.6 per cent and 11.8 per cent respectively, or an average percentage of 12.7; for the remaining groups the respective percentages were 5, 4.2, 0, and again 0, an average of 2.38 per cent for the four groups. The mortality rate for the entire series of cases was 5.69 per cent, a rate which compares favorably with other statistics in the literature.

Because of this reduction in mortality it is now the policy of the Hazelton State Hospital to treat acute cholecystitis expectantly, and when the delay results in improvement of the condition of the patient, cholecystectomy is preferred to cholecystostomy and seems to be better borne than the less radical operation when it is performed immediately. However, the policy is a flexible one; if there is progression of symptoms and signs, that is, if there is evidence of progression of infection as shown by increasing fever, the leucocyte count, the pulse rate, and an increase in size of the tender area together with muscle spasm, the expectant treatment is interrupted and the operation, preferably cholecystectomy, is performed. Cholecystostomy is now used only in aged individuals whose condition is such that a more extensive operative procedure is contraindicated on the basis of age and debility alone.

JOHN W. BRENNAN, M.D.

Schenken, J. R., and Coleman, F. C.: Cholelithiasis. *Gastroenterology*, 1945, 4: 344.

Schenken and Coleman place on record the history of a white female patient aged thirty-seven, who was suffering from cholecystitis. A cholecystectomy was performed and the gall bladder was found to contain 36,329 stones. The count was made by one person, a student assistant during his senior year at the Louisiana State University School of Medicine. The stones were divided into small groups and only one group was counted at a time to avoid error.

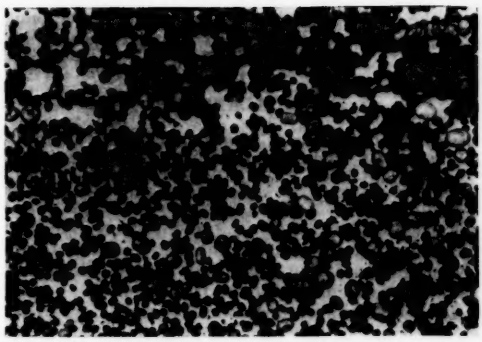

Fig. 1. Photograph of a small portion of the stones found in the gall bladder. Note that all of the smaller stones are facetted. (×2)

BENJAMIN GOLDMAN, M.D.

Cattell, R. B.: Pancreatoduodenal Resection. *N. England J. M.*, 1945, 232: 521.

Eighteen patients were submitted to pancreatoduodenal resection at the Lahey Clinic. Ten additional patients had a first-stage operation and a second operation was planned. One patient refused a second procedure; another was considered too poor a risk to withstand it, and still another was not operated upon further because he presented vessels resembling hemangiomas throughout the operative field. Two patients were found inoperable because of metastases; 1 patient had involvement of the superior mesenteric vessels, and 1 had a benign tumor that could be removed locally from the ampulla. In addition, 3 patients were explored at the second stage and after the pancreas was freed no tumor was found and the operation was discontinued. There were 13 men and 5 women who underwent the completed operation, and only 2 of them were between forty and forty-five years of age.

The presenting symptom in 16 cases was jaundice, and in 2, anemia of unexplained origin. Only 2 patients did not have a weight loss. One patient has remained well for two years, 5 for eighteen months, 4 for a year, and 3 are in good condition, having been operated upon within the past year. Five patients had a one-stage pancreatoduodenal resection with 1 death; the two-stage procedure was employed in 13 patients with 2 deaths, a mortality rate of 17 per cent. Two patients have died subsequent to leaving the hospital, eight and ten months following operation, respectively.

The author briefly describes his operative technique. The particular points stressed are elevation of the pancreas and duodenum in order to determine if the case is operable before the stomach is divided,

and the author's method of transplanting the pancreatic duct in the jejunum. All anastamoses are anticolic. EARL O. LATIMER, M.D.

MISCELLANEOUS

Dixon, J. L., Martin, G., and Ochsner, A.: Treatment of Abdominal Injuries. Review of 88 Personal Cases. *Am. J. Surg.*, 1945, 68: 143.

In former wars many abdominal injuries were considered hopeless, but at present more efficient methods of transportation and the creation of special surgical units for the care of abdominal injuries have made the outlook more favorable.

If shock or impending shock is present, its treatment should be the primary consideration. From ¼ to ½ gr. of morphine is given subcutaneously or ⅙ gr. is injected into the vein. In the absence of head and chest injuries the foot of the bed is elevated 12 inches, and 5 per cent glucose in normal saline solution is given immediately, followed by plasma or blood. Adrenal cortical hormone (75–100 dog units), given intravenously, has been recommended by some, but its value has been disputed. Excessive warming of the patient is detrimental, but chilling must be prevented; therefore, patients are covered with blankets. Oxygen should be given by means of a nasal catheter or the Boothby mask to prevent anoxia. The pulse and blood pressure should be recorded at least every fifteen minutes.

Patients can be divided into three types: (1) patients who respond well to shock treatment and show stabilization of their blood pressure and pulse rate for from one to two hours—these may be operated upon if exploration is indicated; (2) patients responding to treatment of shock only for a short period of time and then relapsing—these suggest the presence of intra-abdominal hemorrhage and should be operated upon at once in order to control bleeding; further blood transfusion will be necessary; (3) patients who do not respond to adequate shock therapy but continue in profound collapse; these are hopeless cases and surgery may only hasten death; however, such heroic surgery may occasionally prove life-saving.

Aids in Diagnosis. The amount of blood loss is best estimated by the serum-protein determination and by the falling-drop method of Barbour and Hamilton, together with hematocrit readings. The leucocyte count is of little value; urinalysis may indicate bladder injury, and x-ray examination with sodium-iodide instillation or cystoscopy may be necessary. A rectal examination should be done to determine the presence of blood in the rectum.

Roentgenograms are of diagnostic value to determine free gas in perforating wounds of the abdomen; the erect position of the patient for the anteroposterior roentgenogram is desirable, but in the presence of shock the anteroposterior roentgenogram with the patient in left lateral decubitus is preferable. Absence of air under the diaphragm, or under the right costal margin, respectively, does not preclude perforation, especially when the injury does not involve the stomach or colon. Peritoneal aspiration with an 18-gauge spinal needle may yield blood or fecally contaminated peritoneal fluid, and thus verify the diagnosis of a ruptured viscus. However, negative results in one area do not preclude positive findings at another point.

Patients not requiring operation. 1. Those in whom shock is controlled and the injury is confined to the liver substance with no possibility of injury to the gall bladder or extrahepatic bile ducts. Bleeding from the liver usually responds to conservative treatment, and packing or suturing of the liver is only rarely necessary. 2. Those with nonpenetrating wounds confined to the abdominal wall and associated with considerable blunt trauma. 3. Those with penetrating wounds made with a small sharp instrument, such as an ice-pick, or with multiple bird-shot wounds. Since small-bowel perforations seal over without leakage, only careful observation with conservative therapy is indicated. 4. Those with injuries of long duration and beyond anatomical and functional repair. However, whenever there is reasonable doubt an exploratory operation should be resorted to.

Patients definitely requiring operation. 1. Those in whom shock continues for from one to one and one-half hours despite adequate shock therapy and blood transfusions; in these cases intra-abdominal hemorrhage is usually present and must be controlled, and blood transfusions must be continued. 2. Those with abdominal-wall wounds with protrusion of the torn gut or omentum. 3. Those with definite evidence of perforation of a hollow viscus as suggested by vomiting of blood, bloody stools, or signs of peritonitis. 4. Those with increasing abdominal pain and rigidity. 5. Those with x-ray evidence of air under the diaphragm. 6. Those with an increasing pulse rate in the presence of questionable evidence of intra-abdominal injury. 7. Those with kidney injuries when there is evidence of excessive retroperitoneal hemorrhage, manifested by bulging of the flank, pain, hematuria, and increasing shock. 8. Those with injury to the bladder determined by hematuria, cystography, or cystoscopy.

For preanesthetic medication, morphine (¼ to ⅙ gr.) with scopolamine (1/100 to 1/150 gr.), in preference to atropine, are recommended. Three thousand units of tetanus antitoxin should then be given; if toxoid had been given previously a booster dose is necessary. In the presence of severe contamination polyvalent gas-bacillus antitoxin is recommended.

The anesthetic should allow quiet respiration, high oxygenation, complete abdominal relaxation, and rapid return of consciousness after surgery. Ethylene induction followed by ether and oxygen allow up to 90 per cent alveolar oxygen concentration; cyclopropane and oxygen allow from 60 to 70 per cent oxygen concentration. Spinal anesthesia should be used only when there is no evidence of shock or impending shock. Nitrous oxide is not recommended because it does not allow sufficient oxygenation nor

relaxation. Pentothal is not an anesthetic of choice, because of frequent laryngeal spasms, anoxemia, and incomplete relaxation, and difficult control in shock. When it is used, oxygen should be given simultaneously. In 7,500 cases of pentothal anesthesia in the Army overseas, the death rate attributable to pentothal was reported to be six times higher than that from all other anesthetic agents combined. A local anesthetic may be used for small nonpenetrating wounds. The wound should be scrubbed with soap and water for ten minutes. The longitudinal paramedian incision allows better exploration, and may be extended to an "L" or "T" shape. The blood-filled abdominal cavity should be emptied by suction; reinfusion of this blood is recommended only if no other blood or plasma is available. First, a search for bleeding points should be made. The exploration should be made according to the site of the external wounds. Injured vessels may be found in the root of the mesentery of omentum, and hemorrhage may be stopped by digital pressure and subsequent ligation. Before the abdomen is closed, careful search should be made to determine whether the blood supply to the bowels was not interfered with by ligation; when this has been the case adequate resection will have to be made. Perforation of the pancreas may require mattress sutures over a macerated plug of skeletal muscle or packing. Liver wounds, only if bleeding profusely, need treatment of a similar nature. Bleeding from the spleen usually requires splenectomy. This is followed by systematic exploration for perforation, beginning in the middle of the transverse colon and extending to both sides to the cecum and rectum. The small intestine is best checked from the Treitz ligament downward; then the stomach and duodenum, including their posterior surfaces, must be visualized. When proper suturing of the bowel perforation appears impossible resection may be necessary; however, in the presence of shock a double-barrelled enterostomy or colostomy of the Mikulicz type is preferable.

Perforating bladder injuries should be treated by cystotomy and closure of the perforation from the inside of the bladder and insertion of a suprapubic catheter; the space of Retzius may also be drained.

Local implantation of sulfonamides causes excessive exudation and undoubtedly interferes with wound healing; therefore systemic administration is preferred. No intraperitoneal drain is used, but a drain is placed through the wound down to the peritoneum to prevent rupture of an abscess into the peritoneal cavity. Cotton is preferred for wound closure, but wire may be used for rapid closure with through-and-through sutures.

Postoperative care includes morphine (gr. ¼) every four hours, Wangensteen suction with the Levine or Miller-Abbott tube, a heat tent to the abdomen, the Trendelenburg position until the patient awakens from anesthesia, then Fowler's position, a change of the patient's position every hour, encouragement of deep breathing and coughing,

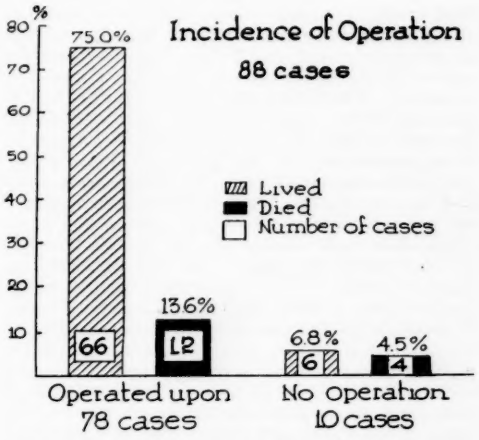

Fig. 1. Graphic representation of incidence of laparotomy and mortality in authors' cases. (Courtesy of the American Journal of Surgery.)

2,000 c.c. of 5 per cent glucose, and 1,000 c.c. of glucose in saline solution; the urine output should be at least 1,500 c.c. Blood transfusion and plasma or amino acids should be given according to the findings. Sodium-sulfadiazine (2 gm. intravenously) should be given three times daily to reach a blood level of from 8 to 10 mgm. per cent. Vitamin C (300 mgm.), vitamin B (60 mgm.), and niacin (150 mgm.) given daily are recommended. Oxygen is given to prevent anoxemia and to aid absorption of nitrogen from the gastrointestinal tract. Suction is continued until the ileus subsides and active peristalsis can be heard with the stethoscope, a positive pyloric balance (Bartlett) is found, and gas is passed by rectum; then feeding is resumed gradually, starting with fat-free broth and plain tea.

Postoperative complications. Atelectasis develops rapidly within twenty-four hours; treatment consists in encouraging expectoration, and aspiration with the nasal catheter, or, if necessary, by bronchoscopy.

Treatment of thrombophlebitis includes daily lumbar sympathetic block, elevation of the leg, and the use of elastic bandages and heat. Ligation of the femoral vein is reserved for rare cases with suppurative thrombophlebitis or pyophlebitis. However, immediate femoral-vein ligation should be the rule in every phlebothrombosis confirmed by phlebography. Peiritonitis may frequently localize in the cul-de-sac, which may require incision and drainage through the anterior rectal wall. A subdiaphragmatic infection usually requires conservative therapy, but if an abscess develops drainage should be done by the extraperitoneal approach with resection of the twelfth right rib.

The four patients who died without operation were practically moribund at the time of admission.

Stab wounds (39 cases) showed the lowest mortality (5.1 per cent); 42 gunshot wounds showed a mortality of 26.2 per cent, and 7 crush injuries, 42.8 per cent; 5 of the last 7 cases were due to automobile accidents. Tabulation of the 16 fatalities which occurred in the authors' series reveals that shock and hemorrhage were given as the cause of death in 11 cases, pneumonia in 2, and pulmonary hemorrhage, peritonitis, and transfusion reaction in 1 case each. Consideration of the time of surgery showed that if the patients were operated upon within two hours after injury none died, while the mortality rose to 29.4 per cent if the interval rose to more than four hours. Duration of the operation varied from less than one hour to more than two and one-half hours. Comparison of the mortality figures, according to the duration of surgery, seems to indicate that speed is essential to save some of these patients; but it also appears likely that in extensive injuries undue haste may cause one to miss some of the visceral perforations, which would contribute to the mortality.

ARTHUR J. LESSER, M.D.

Brindley, G. V.: Sacral and Presacral Tumors. *Ann. Surg.*, 1945, 121: 721.

A majority of the chordomas and ependymomas are malignant lesions with a low degree of cellular activity. They tend to recur locally rather than by distant metastasis. According to the histories of reported cases, most of the chordomas develop a local recurrence. The operative notes for some of these cases state that all apparently malignant tissue was removed with a curette. Curetting a malignant lesion rarely, if ever, results in a cure.

The ideal to be attained by the surgical procedure is an initial, complete surgical extirpation of the neoplasm, the field free from contamination by transplanted malignant cells. The appreciation of adequate exposure is important. The sacrifice of important structures must be accepted when necessary for the complete eradication of the disease. Much of the lower portion of the sacrum, the coccyx, the lower three sacral nerves, and the muscles of this region can be removed without causing any severe disability.

Recognition of this fact should lead to more radical primary excision of the operable lesions. The use of the cautery knife as the agent for the excision definitely increases the probability of leaving the field free of transplanted malignant cells. Surgical treatment for these neoplasms based on these facts will result in a smaller percentage of local recurrence and also will definitely increase the number of patients cured.

JOSEPH GASTER, M.D.

GYNECOLOGY

UTERUS

Abarbanel, A. R.: The Spasmolytic Action of Magnesium Ions on the Tetanically Contracting Human Gravid Uterus. *Am. J. Obst.*, 1945, 49: 473.

The magnesium ion has been graphically demonstrated to exert an immediate spasmolytic effect upon the tetanically contracting human gravid uterus. Magnesium abolished tetany induced by the following oxytocic agents: posterior-lobe pituitary hormone—whole extract (pituitrin); purified oxytocic fraction (pitocin); purified vasopressor fraction (pitressin); quinine; ergonovine; and methergine (a synthetic ergonovinelike substance). Satisfactory results were obtained by the intravenous administration of either 2 c.c. of a 50 per cent solution of magnesium sulfate or 10 c.c. of a 20 per cent solution of magnesium gluconate. Magnesium probably acts directly on the myometrium, slowing the rate of the contraction wave.

Induced uterine tetany may be prevented by the prophylactic intravenous administration of magnesium salts from three to five minutes after administration of the oxytocic agent.

Posterior-lobe pituitary hormone should not be given in a dose exceeding 1 I.U., that is, 0.1 c.c. or 1.5 minims, and should be measured out in a tuberculin syringe.

Magnesium ion has no demonstrable effect upon the pattern of uterine motility in the first stage of labor. It does, however, exert a definite analgesic effect as far as the patient is concerned.

Calcium ion has little or no value as a spasmolytic agent upon induced uterine tetany.

Clinical use of the antispasmodic properties of the magnesium ion has accomplished the following:

A. Immediate relaxation of oxytocic-induced uterine tetany
   1. During induction of labor or management of second-degree uterine inertia
   2. In the third stage of labor for a separated or incarcerated placenta.
B. Prevented uterine tetany following the use of oxytocics.
C. Relief of afterpains.
D. Alleviation of essential spasmodic dysmenorrhea.
E. Relaxation of Bandl's ring.
F. Relaxation of tetanically contracted uterus in abruptio placentae.

EDWARD L. CORNELL, M.D.

Cashman, B. Z.: Hysterectomy with Preservation of Ovarian Tissue in the Treatment of Endometriosis. *Am. J. Obst.*, 1945, 49: 484.

This survey includes 271 cases of hysterectomy. The largest number of cases (79 per cent) occurred in patients between twenty-five and forty-five years of age. Of 26 patients who were less than twenty-five years of age, 10 had chocolate cysts of the ovary and 6 had endometriomas in old abdominal scars. The others had endometrial implants on the peritoneum or sacrouterine ligaments. There were 10 patients between fifty and sixty years of age; 3 of them were still menstruating and these had adenomyosis or adenomyomas of the uterus. The remaining 7 were past the menopause and the operations were done for other conditions (ovarian cysts [malignant and benign], prolapsus uteri, and 1 granulosa-cell tumor of the ovary), and localized adenomyosis of the uterus was found.

One hundred and ninety-four patients were married and 137, or 70.6 per cent, gave a history of pregnancy. One hundred and twenty-eight, or 66 per cent, had children and the 9 others had had miscarriages. Seventy-seven were single.

Eighty-nine had fibromyomas and 19 had adenomyomas, or an incidence of 39.8 per cent of myomas. Chocolate cysts were present in 73 cases.

Conservative operations (removal of one ovary and/or resection of the ovaries without hysterectomy) were done in 16.8 per cent of the cases, in the younger groups when the disease was not advanced.

Removal of all ovarian tissue, with or without hysterectomy, was done in 39 cases, and radium was used in 5, an incidence of 28.4 per cent of ovarian ablation.

In the follow-up series there were 17 cases in which at operation definite nodules were found in the wall of the rectosigmoid, binding the bowel to the posterior surface of the cervix and uterus.

Hysterectomy with conservation of some ovarian tissue was done in 85 cases, or 54.8 per cent, and in 29 cases the uterus alone was removed.

In young women, the surgical treatment of recognized endometriosis should be postponed as long as possible and the decision for operation should be determined by the severity of the symptoms and the extent of the disease.

In endometriosis, unrecognized before laparotomy, conservative surgical measures should be used when there is a possibility of future pregnancy and when the symptoms are severe; the extent and location of the lesions are also determining factors.

Total ablation of the ovaries in the surgical treatment of endometriosis in women in the menstrual life is not necessary for the relief of this condition, and the precipitate menopause is not desired.

Removal of the uterus with preservation of uninvolved ovarian tissue is effective and prevents a precipitate menopause. EDWARD L. CORNELL, M.D.

Meigs, J. V.: The Wertheim Operation for Carcinoma of the Cervix. *Am. J. Obst.*, 1945, 49: 542.

There was no postoperative mortality in this group of 65 patients who were subjected to the

Wertheim operation for carcinoma of the cervix. This result is of major importance, for with the excellent results obtained with radium and x-ray treatment, no one would dare resort to surgery if the mortality were high. These figures prove that surgery can be done safely, and therefore it is appropriate that surgical treatment should be evaluated by its use in a large series of cases. The fear of a high mortality should no longer be a deterrent to the surgical treatment of selected cases of cervical cancer. Of 65 patients, 5 (7.7 per cent) are known to be dead, and 3 of these had positive lymph nodes. Of the 53 patients who did not have positive nodes, only 2 are dead, a survival rate of 96.3 per cent. Of the total of 65 patients, 5 are dead, 2 have recurrent disease, and 1 was lost, which gives a total or probable loss of 12.3 per cent and a corrected survival figure of 87.7 per cent.

It is not possible to compare these figures with known five-year results following the use of radium, but of this group of patients, 2 are alive five years or less; 5, for four years or less; 9, for three years or less; 18, for two years or less; and 25, for one year or less. Undoubtedly some will die, but judging from the results and seeing the patients in follow-up clinics, the author predicts that the ultimate results of this five-year series will be more satisfactory than those in similar groups treated with radium or radium plus x-ray therapy.

No correlation could be made of the 8 patients who died, were lost, or are living with disease as to the extent of the disease or grade of the cancer. The dead or dying are too few to attempt any statistical evidence. Three who died had positive lymph nodes, which is perhaps a significant fact.

Surgical removal of the early cancer is as safe as radiation treatment of it.

The number of fistulas of the ureterovaginal type is too large, but with a better understanding of the blood supply, fewer such calamities are expected.

Lymph-node involvement is curable by surgery as evidenced by the reports of Bonney and Taussig, and the results of this series point toward that eventuality also. EDWARD L. CORNELL, M.D.

Mengert, W. F., and Stoltz, R.: Total Abdominal Hysterectomy. *Am. J. Obst.*, 1945, 49: 603.

Total abdominal hysterectomy was performed on 1,925 women, most of whom were white and indigent. The majority of the patients (59.3 per cent) remained in the hospital from two to five days before operation. Only 12.4 per cent were operated on within twenty-four hours of admission. The majority of the operations (63.4 per cent) were done by assistant residents or residents.

The principal indications for hysterectomy included fibromyomas, functional bleeding, pelvic inflammatory disease, benign and malignant ovarian tumors, and malignant uterine tumors.

The ureters were injured in 10 women, with 9 repairs at the time of initial operation. Subsequent operation for reimplantation was necessary in 1 patient. Morbidity rates were similar to those of any hysterectomy series, irrespective of the type of operation.

Death occurred in 38, or 1.97 per cent, of the patients. Twenty-nine (3.01 per cent) of the fatalities occurred in the first chronological half of the series and 9 (0.94 per cent) in the second. Infection of some type, chiefly peritonitis, accounted for 22 of the 38 deaths.

Total hysterectomy in an indigent clientele can be performed without undue hazard by young men in training. EDWARD L. CORNELL, M.D.

ADNEXAL AND PERIUTERINE CONDITIONS

Wyatt, J.: The Effect of Testosterone Propionate on 2 Cases of Ovarian Carcinoma. *J. Obst. Gyn. Brit. Empire*, 1945, 52: 174.

The author presents 2 cases of ovarian carcinoma treated by surgery, irradiation, and testosterone propionate, the latter being given because of the possibility that it might inhibit the growth of the neoplasm. Although both of the patients were subjectively improved, there was no evidence of regression in the neoplasm. Both patients died of carcinoma.

J. ROBERT WILLSON, M.D.

Parks, T. J.: Carcinoma of the Ovary Treated Preoperatively with Deep X-rays. *Am. J. Obst.*, 1945, 49: 676.

Three cases of papillary cystadenocarcinoma, inoperable because of massive infiltration into the surrounding structures, are presented because they were apparently made operable by deep x-ray therapy. In all 3 cases the neoplasm was limited to the abdominal cavity. The x-rays profoundly affected the gross appearance of the tumors, but caused very little change in the microscopic picture.

Two of the patients are alive after eight and twelve years, respectively; the third succumbed after five years to an apparently unrelated carcinoma.

Deep x-ray therapy in the 3 cases reported caused the papillary excrescences and transplants to shrink and the entire mass to diminish in size, which made the operation easier.

This study indicates that it is unwise to persist in doing a difficult primary operation. In some cases of massive infiltration, it may be safer to take a biopsy, close the abdomen, give deep x-rays, and perform a second operation at a later time.

EDWARD L. CORNELL, M.D.

EXTERNAL GENITALIA

Brady, L.: Methods of Constructing a Vagina. *Ann. Surg.*, 1945, 121: 518.

Vaginas were made for 4 women, but the method used in each case was different. In the first, the labia minora were unusually long, and by utilizing them, it was possible to cover over most of the newly made vagina with epithelium. In the second case, a vagina which has proved satisfactory for several

years was made without any operation. The intelligence and cooperation of this patient played a large part in making this procedure successful. In the third case, the Wharton technique was followed. This consisted in making an elongated canal in the perineum and keeping that tube open by means of a vaginal form of balsa wood. Following the technique which Wharton first recommended, the author made no effort to cover the newly made vagina with epithelium. In the fourth case, an extensive plastic operation was performed in which the labia minora were again used to cover over raw areas, but as they were not long, this step was supplemented by using the skin of the perineum between the urethra and anus. This was accomplished by making an inverted U-shaped incision, dissecting out a flap between the urethra and the anus, and sewing this flap deeply into the newly made vagina.

The third case in this series was particularly interesting, as in addition to the embryological abnormalities of the genital tract, there was also an abnormality of the urological system. The patient's only kidney was low in the pelvis and was mistaken by several examiners for the uterus. There probably is no one best method of making a vagina. In the writer's opinion, one should take into consideration the anatomic findings, and the temperament, intelligence, and marital status of the patient.

CHARLES BARON, M.D.

Wharton, L. R.: Spontaneous Perforation of the Rectovaginal Septum Five Weeks after Construction of the Vagina. *Ann. Surg.*, 1945, 121: 530.

The author states that construction of the vagina involves the dissection of a large space between the rectum and bladder. If there have been former unsuccessful attempts to construct the vagina, the normal plane of cleavage is replaced by dense scar tissue. This makes the dissection extremely difficult and, under these circumstances, injuries of the rectum or bladder have been common and unavoidable.

The author reports a case in which perforation occurred five and one-half weeks after a successful operation and convalescence, and was due to the pressure of the strong perineal muscles on the vaginal form which pushed the vaginal form through the vaginal wall into the rectum.

From his experience with this case, the author concludes that:

1. The vaginal form should never be so short that it lies completely above the muscular plane of the pelvic diaphragm. In this case, the vaginal form was so short that it disappeared completely in the large vagina. Hence, any pressure exerted by the pelvic floor was directed against the end of the form and pushed the form higher against the rectum or cul-de-sac of Douglas. One safeguard against this accident would be to have the form long enough to protrude slightly from the vaginal orifice. A form of such length could not be pushed upward by perineal pressure.

2. A second safeguard against this accident would be to make the vaginal orifice so large that it could not close or contract over the end of the form. It should be large enough to allow the form to escape if the intrapelvic pressure is increased. It should always be easy to reach and remove the vaginal form. The vaginal orifice can be enlarged easily by cutting the constrictor vaginae muscle and the proximal fibers of the perineal fascia. This also prevents dyspareunia later.

3. Constipation is to be avoided. The patient in this report had been constipated. If constipation should develop, the patient should avoid pressure to produce defecation.

4. The method of closure of the fistula was simple. No attempt was made to dissect out the layers of the rectovaginal septum; a loose approximation of the torn edges was provided, and the whole region was put at rest by means of a large rectal tube. In spite of the unfortunate accident, the ultimate result was not entirely unsuccessful.

HERBERT F. THURSTON, M.D.

OBSTETRICS

PREGNANCY AND ITS COMPLICATIONS

Mussey, R. D., Randall, L. M., and Doyle, L. W.: Pregnancy following Myomectomy. *Am. J. Obst.*, 1945, 49: 508.

The experience of Mussey, Randall, and Doyle, as well as that of other authors, indicates that myomectomy has very little effect on the course of future pregnancies. In their series of cases, the incidence of complications of delivery increased somewhat, but with modern obstetric and surgical care the increased risk certainly is not prohibitive. In 101 of the 250 women, pregnancy occurred 167 times after myomectomy was performed. In 135 of the 167 instances, the pregnancy continued to term or nearly to term. In 12, or 9 per cent of the 135 instances, the child was delivered by cesarean section. It is evident, therefore, that cesarean section was required more frequently than it is in an average group of obstetric cases.

It is difficult to evaluate the role of uterine myomas as a cause of infertility without the benefit of a complete examination of all factors influencing the fertility in both men and women. Frequently it is not possible to investigate safely tubal patency in the presence of myomas which are producing symptoms. The opinion prevails that the fertility of women decreases in the presence of myomas. The fact that only 8 of 82 patients who complained of infertility prior to myomectomy subsequently conceived would seem to be in agreement with this statement, although the authors have no knowledge of other factors which may have contributed to the infertility. It is significant, however, that Brewer and Jones did not find evidence of abnormal physiological activity of the ovaries in their studies of the corpus luteum and endometrium in cases of uterine myoma.

A salvage of 128 children in 167 instances of pregnancy among 101 women, who had previously undergone uterine myomectomy instead of hysterectomy or irradiation for fibroids, seems to justify myomectomy in selected cases in which the patients are women of the childbearing age. It is recognized that after myomectomy patients run more risk of remote postoperative complications, such as intestinal obstruction, than they do after hysterectomy, which may be accompanied by peritonealization.

Arnell, R. E., Goldman, D. W., and Bertucci, F. J.: Protein Deficiencies in Pregnancy. *J. Am. M. Ass.*, 1945, 127: 1101.

The present communication is chiefly an attempt to answer two questions: (1) what is the incidence of protein deficiencies as the result of dietary inadequacies, and (2) what is the possible effect of such deficiencies on the mother and child.

As regards the incidence, the authors stress that demonstrable degrees of protein deficiency are not common, but subclinical deficiency is frequent. The average daily antepartum protein intake of 400 patients, of which 50 were private patients (whites) and 350 clinic material, made up of 150 whites and 250 negroes, was investigated. It was found that 72, or 18 per cent, of the 400 patients had a protein intake of less than half of the optimum amount recommended for the latter half of pregnancy. When calculations were based on the ideal weight rather than on the total protein intake in grams, the results were much the same; 74 patients fell into the deficiency group, that is, their daily intake of protein was less than 0.75 gm. per kilogram of body weight, as against a desirable intake of 1.50 gm. per kilogram. Neither a high intelligence rating nor easy financial circumstances precluded the possibility of defective diets.

Since a qualitative as well as a quantitative deficiency may affect the nitrogen equilibrium of the body, it is recommended that proteins derived from animal sources constitute at least 65 per cent of the total protein intake. On the basis of the protein content the diets were classified as excellent (a daily intake of 85 or more gm. of protein) in 9.5 per cent of the patients; good (from 70 to 84 gm.) in 11.5 per cent; fair (from 55 to 69 gm.) in 37.3 per cent; poor (from 42.5 to 54 gm.) in 23.7 per cent; and, finally, very poor (less than 42.5 gm.) in 18.0 per cent. The last group received less than half the amount recommended by the National Research Council.

It is a fairly simple matter to determine the incidence of protein deficiencies in pregnancy as the result of inadequate protein intake. However, to determine the possible effect of such deficiencies on the mother and child is more difficult. For instance, in addition to the intrusion into the picture of such indeterminable factors as abnormal absorption and utilization of the ingested proteins, the more complete utilization of protein within the body when the intake is low, and the increased demands of pregnancy, there is added the lack of method for determining the protein content of the tissues in which a depleted reserve may escape notice, and the indefinite character of the results which follow inadequate protein nutrition when (unless a demonstrable hypoproteinemia develops and edema ensues) the manifestations amount to little more than a slow and insidious wasting away of all the tissues, with associated weakness and general ill health.

However, a significant relationship was usually found to exist between the serum protein concentration of the blood at term and the protein content of the diet during the latter half of pregnancy, the average concentration being lowest in the deficiency group of patients, that is, the fifth group, with less than half the optimum intake. Also, the mean hemoglobin of the deficiency group (8.3 gm. per 100 c.c.) was 26 per cent lower than that of the group in which the protein intake was excellent (11.1 gm. per 100

c.c.). In this type of anemia the administration of iron will be without effect on the anemia until the protein deficiency also is corrected. There is no instance of eclampsia in this series; however, the highest incidence of pre-eclampsia was in the deficiency group. This experience proved the fallacy of the habit of restricting meat and eggs in the diet of the pregnant woman, which was generally practiced in the past and is still practiced in some quarters at the present time. In the past too much attention was focused on obstetric complications and abnormalities as causes of maternal and fetal morbidity and mortality, and too little attention paid to the general nutrition of the patient.

There was no maternal mortality in this series, but a significant relationship was found to exist between the maternal morbidity and the protein content of the maternal diet, the morbidity in the deficiency group being five times greater than in the excellent group. The fetal mortality, including stillbirths and neonatal deaths, also bore a significant relationship to the maternal protein intake, the percentage of fetal mortality for the five groups, from excellent to very poor, being respectively 0, 2.2, 2.0, 4.2 and 5.5. The greater average maternal gain in weight during pregnancy in the deficiency group is explained by the tendency toward high ingestion of carbohydrate and fat, when the protein intake was low, and suggests a diet high in protein for the restriction and reduction of weight during pregnancy. The absence of effect on the average fetal weight at birth supports the assumption that the fetus in utero is a true parasite and explains why the child's birth weight cannot be controlled by any known dietary means.

However, the most striking confirmation of the results of increased protein intake in this series comes from a study of the protein consumption of a small group of selected patients who manifested evidences of protein deficiency. The 11 patients were admitted to the hospital in the last trimester of pregnancy because of massive edema of obscure etiology. Further investigation showed the edema in all of them (oldish multipara) to be due to a basic protein deficiency which left no doubt that the tendency toward protein malnutrition is more likely to develop in older women and that it is increased by the strain of repeated pregnancies in rapid succession. In all these cases complete recovery ensued on a regimen based on reparation of the protein deficiency.

The authors find that the best means of repairing the protein deficiency (in addition to such a high protein diet as will be permitted by the patient's ability to utilize oral feedings) is repeated early blood transfusions, or blood transfusion supplemented by amino acids, to correct the anemia, and, later, transfusions with plasma, or plasma supplemented by amino acids. JOHN W. BRENNAN, M.D.

Quigley, J. K.: Habitual Abortion. *Am. J. Obst.*, 1945, 49: 633.

Prior to the present treatment of repeated abortion, the care of this condition was limited to months of absolute bed rest. This was often ineffectual as women aborted during long immobilization.

The husband and wife should be subjected to investigation as painstaking as that undertaken in the diagnosis of sterility. There is a correlation between these two conditions. Women who are infertile because of ovarian failure and who later conceive, often abort as a result of the cause of their sterility. Appropriate treatment should follow the discovery of any possible causative factors. The correction of a retrodisplaced uterus is best done before conception with the fitting of a pessary. Too much manipulation of a pregnant uterus may cause abortion. In the majority of cases, however, no local causes are found, and the management resolves itself into measures aiming to correct deficiencies of endocrines and vitamins. The patient should be instructed to refrain from exertion on the days of her first 4 missed menstrual periods. Intercourse should be interdicted for four months. The entire subject should be carefully explained to her; she should be encouraged, but no absolute promise of success should be given. Because of their intense desire for children, these patients are usually co-operative.

Progestin is given by intramuscular injection, 5 units every four days, after the first missed period. In case of any bleeding or pelvic pain, the patient should be put to bed and the frequency of the progestin injections increased. Morphine is not indicated, but simple sedatives can be used. Peroral administration of anhydrohydroxyprogesterone offers a more convenient method of therapy. Hamblen believes it to be as efficient as the intramuscular injection of progestin. Soule, Krohn, and Greenblatt concur in this. Still another method should, because of its simplicity and economy, receive further trial—that of pellet implantation, described by Mishell. Interruption in the third trimester of pregnancy initiated by contractions or rupture of the membranes may be due to the preponderance of estrogen. Progestin is indicated and may act as an antagonist to prevent premature labor.

Twenty-eight of the 30 women who were habitual aborters went to full term or near it, under treatment, and gave birth to normal children. Uterine curettage was done in 3 cases, and in 4 cases thyroid extract was given. Successful termination of a pregnancy treated prophylactically against abortion does not guarantee full term in a subsequent pregnancy that is untreated.

Two possible fields for further investigation as to the cause of repeated abortions are: (1) the quantitative relation between the estrogen and corpus-luteum secretions; and (2) blood incompatibility of the husband and wife similar to the Rh factor in erythroblastosis.

While there is some question from experimental evidence as to the value of progestin to prevent abortion, the author believes that the results reported by many careful observers warrant its continued use, at least until a better method is evolved.

EDWARD L. CORNELL, M.D.

Scott, W. A.: Surgical Complications during Pregnancy and Labor. *Am. J. Obst.*, 1945, 49: 494.

In the series of cases under study there were 51 in which fibroid tumors were discovered in pregnant women.

Seventeen of these patients required operation during pregnancy, 3 were dealt with at the time of labor, and 31 did not require surgery, only palliative measures. Seven of the 17 patients requiring surgical treatment during pregnancy were treated by myomectomy; 5 of these were subsequently confined at term; 1 had an incomplete abortion and was curetted at the time of the myomectomy; and 1 died of pulmonary embolism following the operation. Ten patients were treated by hysterectomy for various reasons. There were 3 cases in which treatment was necessary at the time of labor. Thirty-one patients did not require any surgical treatment during pregnancy and labor.

Ovarian tumors complicate pregnancy less frequently than do fibroids, but conservative measures play a smaller role in their treatment. In this series, there were 16 patients with ovarian tumors. Of these, 10 were in their first pregnancy, 2 in the second, 2 in the third, 1 in the fifth, and 1 in the sixth pregnancy. All of these patients were operated upon.

Apart from small inclusion cysts near the introitus, the common cystic tumor of the vagina arises from the remains of Gartner's duct. The author encountered 5 patients with such tumors. In only 1 of the cases was it found necessary to evacuate the cyst.

There were 42 pregnant patients sent to the hospital with a diagnosis of acute appendicitis. In 21 of these the diagnosis was concurred in after admission. Eighteen of the 21 patients with a diagnosis of appendicitis were operated upon. Following operation, 6 abortions occurred. There were 7 cases of intestinal obstruction during pregnancy. In 2, the condition was due to carcinoma of the sigmoid; in 2, to adhesions; 1 patient had an umbilical hernia which became strangulated with symptoms of obstruction; 1 patient developed intestinal obstruction three weeks after removal of his appendix and an inflamed tube; and 1 patient was not operated upon.

Nine patients were admitted to the hospital with a diagnosis of hyperthyroidism during pregnancy. In 5 of these, the diagnosis at the hospital was simple colloid goiter, and the symptoms were interpreted as being the result of pregnancy. All were treated expectantly, and all went to term. Three patients had true toxic goiters, 1 being an exophthalmic goiter and the 2 others toxic adenomas. All 3 patients were operated upon and in no case did miscarriage occur.

When fibroids complicate pregnancy, conservatism in treatment is usually indicated.

Ovarian neoplasms usually require operation during pregnancy.

The correct diagnosis of appendicitis during pregnancy is frequently difficult.

Symptoms due to the pregnancy, or to attempts to produce abortion, may lead to an erroneous diagnosis. A large percentage of pregnant patients sent to the hospital because of acute appendicitis do not have the disease.

In the treatment of hyperthyroidism and pregnancy, the following must be determined:

1. Is hyperthyroidism really present?
2. If so, is the condition an exophthalmic goiter, or a toxic adenoma? If the former, conservative treatment will often be satisfactory, but if toxic adenoma is present, surgical treatment is indicated.

EDWARD L. CORNELL, M.D.

LABOR AND ITS COMPLICATIONS

Lynch, F. J.: Rupture of the Uterus. *Am. J. Obst.*, 1945, 49: 514.

At the Boston City Hospital in the last twenty-five years rupture of the uterus occurred 44 times among 41,706 consecutive cases of pregnancy, an incidence of 1 in 1,118 cases. The maternal mortality in this series of cases was 52 per cent, and the fetal mortality, 89 per cent.

This figure is no accurate index of the incidence of ruptured uterus as this number will vary with the size of the area served by the emergency service. Also, many cases are unreported because of inaccurate diagnosis, deliberately, or for various other reasons.

The prognosis is very definitely influenced by the amount of time which elapses between the occurrence of the rupture and the establishment of proper treatment. Most of the cases are preventabie as they occur chiefly in women in whom ill-advised obstetric procedures have been undertaken to hasten the delivery of the baby, or in patients who have been given oxytocic drugs.

Rupture of the uterus during pregnancy or labor following a cesarean section occurs frequently. In such cases the prognosis for the mother is far better than in other cases of complete rupture. It is extremely hazardous to permit a woman who has had a cesarean section for a nonpelvic indication to be delivered subsequently from below. Women who have had a previous cesarean section should have the strictest supervision and attention in the last weeks of pregnancy, and if another section is decided upon, it should be done a week or ten days in advance of the expected date.

The treatment which has produced the best results is laparotomy and either supravaginal or complete hysterectomy. In occasional cases it may be permissible to repair the rupture in an attempt to conserve the uterus for a possible subsequent pregnancy. Palliative measures may be considered only in the lesser degrees of incomplete rupture or when hospital facilities are not available.

The universal availability of dried plasma and the general prevalence of blood banks should definitely reduce the mortality of this condition.

EDWARD L. CORNELL, M.D.

Potter, M. G., Erving, H. W., and Brown, J. B.: Observations on Breech Deliveries in a General Hospital. *Am. J. Obst.*, 1945, 49: 567.

Of 23,916 patients delivered during thirteen and one-half years by the obstetric service of a general hospital, 3.2 per cent had babies presenting by the breech.

Thirteen and six-tenths per cent of the infants weighed less than 5 pounds, and prolapsed cord occurred in 1.6 per cent of the cases. There was a gross fetal mortality of 17.4 per cent, and a corrected fetal mortality of 9.6 per cent. For primiparas this corrected fetal mortality was 9.6 per cent and for multiparas it was 8.1 per cent. Seventy-nine of the fetal deaths, including 46 due to cerebral damage, can be justly attributed to the breech presentation or delivery.

There were 7 maternal deaths, 13 third-degree, 123 second-degree, and 130 first-degree lacerations, and 60 episiotomies. The maternal morbidity was 11.5 per cent.

Breech presentation is a major obstetric complication with a high fetal and maternal mortality and a high maternal morbidity. Prematurity occurs from two to three times more often and prolapsed cord about four times more often in breech presentation than in pregnancies in general.

Breech extraction demands recognition of complete effacement of the lower uterine segment and proper dilatation of the external os. It is of fundamental importance to remember that the head is not molded, but is usually extended, and that the arms cannot be controlled. Haste is unnecessary and often fatal to the baby. Making the head and arms of the fetus the x-ray target is an important adjunct in determining the type of procedure to be followed.

The more common use of elective cesarean section as a method of delivery in breech presentation, especially in primiparas with borderline fetopelvic disproportion, is advocated.

EDWARD L. CORNELL, M.D.

NEWBORN

Waddell, W. W. Jr., and Whitehead, B. W.: Neonatal Mortality Rates in Infants Receiving Prophylactic Doses of Vitamin K. *South. M. J.* 1945, 38: 349.

From March, 1940 through December, 1943, there were born in the University of Virginia Hospital 3,775 live infants weighing 1,000 gm. or more (Series A). Each of these infants was given 3.2 mgm. of synthetic vitamin K[1] intramuscularly immediately after birth. In addition 2,879 mothers of these infants received 1 c.c. of synthetic K intravenously or intramuscularly one hour or more previous to delivery.

[1] 1 c.c. of the synthetic vitamin K preparation used in these studies contains 3.2 mgm. of 2-methyl-1, 4 napthohydroquinone-3 sodium sulfonate which is the equal of 2 mgm. of 2-methyl-1, 4 napthoquinone.

TABLE I.—COMPARISON OF SERIES A AND SERIES B

3,775 Infants Receiving Vitamin K (Series A)

Total mortality rate	Per Cent
Live births above 1,000 gm.	3.15
Live births above 2,500 gm.	1.03
Live prematures (1,001 to 2,500 gm.)	28.23
Percentage of prematures above 1,001 to 2,500 gm.	7.78

1,429 Infants Receiving No Vitamin K (Series B)

Total mortality rate	Per Cent
Live births above 1,000 gm.	3.53
Live births above 2,500 gm.	0.85
Live prematures (1,001 to 2,500 gm.)	27.70
Percentage of prematures (1,001 to 2,500 gm.)	10.35

During the years of 1937 and 1938 there were born in the University of Virginia Hospital 1,429 live babies weighing 1,000 gm. or more who received no vitamin K. These (series B) were used as controls.

In Table 1 the mortality rate of 3,775 infants (series A) treated in a prophylactic manner with vitamin K is compared with the mortality rate of 1,429 infants (series B) who received no vitamin K. No appreciable change in neonatal mortality rate is noted.

In Table 2 the mortality rate of 2,917 adequately treated infants (series C) born of mothers receiving vitamin K parentally one hour or more before delivery is compared with the mortality rate of 945 inadequately treated infants (series D) born of mothers receiving vitamin K less than one hour before delivery. Five hundred and thirty-five mothers in series D received no vitamin K and the remainder received vitamin K at brief intervals ranging from five mintues up to one hour.

TABLE II.—COMPARISON OF SERIES C AND SERIES D

2,917 Infants Adequately Treated through Mothers One Hour or More before Delivery and Supplemented after Birth (Series C)

	Per Cent
Total fetal mortality above 1,000 gm.	3.53
Total fetal mortality above 2,500 gm.	1.03
Total premature fetal mortality (1,001 to 2,500 gm.)	25.32
Percentage of stillbirths (above 1,000 gm.)	1.30

945 Infants Inadequately Treated Through Mothers One Hour or Less and Supplemented After Birth (Series D)

	Per Cent
Total fetal mortality above 1,000 gm.	10.98
Total fetal mortality above 2,500 gm.	4.50
Total premature fetal mortality (1,001 to 2,500 gm.)	63.72
Percentage of stillbirths (above 1,000 gm.)	5.18

The ratio of 3:1 in favor of the adequately K-treated cases might appear to constitute convincing proof of the efficiency of vitamin K, but a thorough analysis revealed that the higher mortality rate in series D was due to the preponderance of those factors usually associated with death of the infant rather than the lack of vitamin K.

The authors advise the intramuscular injection of vitamin K in all infants soon after birth for the prevention of hemorrhagic disease of the newborn.

ERNEST E. ARNHEIM, M.D.

Rosenthal, S. R., Blahd, M., and Leslie, E. I.: Ten Years' Experience with BCG. (Experimental and Clinical.) *J. Pediat.*, S. Louis, 1945, 26: 470.

In a study of bacillus Calmette-Guérin vaccination in which special emphasis was placed on having adequate controls and in which the multiple puncture technique was used to introduce the vaccine, the following results were obtained:

1. This vaccine has been found to be entirely innocuous both locally and generally in animals studied over a period of ten years and in 1,302 newborn infants which were observed over a period of seven years.

2. Among 1,204 vaccinated children with no known source of contact with tuberculosis, there were 3 cases of tuberculosis and 1 death from the disease; whereas among 1,213 controls there were 23 cases of tuberculosis and 4 deaths from the disease. The follow-up period was from three to eighty-four months.

3. Among 98 vaccinated newborn infants who were in contact with tuberculosis following vaccination there was 1 case of tuberculosis and no deaths; whereas among 63 controls three were 4 cases of tuberculosis and 3 deaths.

4. With regard to the contact and noncontact group as a whole there were 27 cases of tuberculosis in the control group against 4 cases in the vaccinated and there were 7 deaths from tuberculosis in the control group and 1 in the vaccinated.

From these results the authors conclude that in the first seven years of life bacillus Calmette-Guérin vaccination is of definite value in the prevention of tuberculosis.

The authors recommend that the benefit of this vaccination should be given to all children living in highly infected tuberculous areas, notwithstanding the absence of tuberculosis in their immediate households. When tuberculosis is known to be present, strict isolation, as with other infectious diseases, should be practiced. In other words, bacillus Calmette-Guérin vaccination should be applied as is any other type of vaccination. It is well known that casual contact is responsible for the great majority of infectious diseases. ERNEST E. ARNHEIM, M.D.

MISCELLANEOUS

Hutter, A. M., and Parks, J.: The Transmission of Penicillin through the Placenta. *Am. J. Obst.*, 1945, 49: 663.

One hundred thousand units of penicillin injected intramuscularly into the pregnant patient at term will result in an adequate bacteriostatic penicillin level in the fetal circulation. The author has no data on the passage of penicillin through the placenta of the patient in the first or second trimesters of pregnancy. One patient had positive blood serology, but a normal-appearing placenta. Another patient had moderately severe pre-eclamptic toxemia with multiple small placental infarcts.

The fact that penicillin passes from the maternal into the fetal circulation in effective concentrations suggests a wide therapeutic application of a relatively nontoxic agent for the control of penicillin-susceptible infections which affect the mother and her unborn infant. Of these infections, syphilis should receive greatest consideration. If penicillin will eradicate syphilitic infections in the mother and fetus, it should replace the much more toxic arsenical preparations in the treatment of syphilis in pregnancy. EDWARD L. CORNELL, M.D.

GENITOURINARY SURGERY

ADRENAL, KIDNEY, AND URETER

Nation, E. F.: Renal Ectopia. A Study of 23 Cases. *Am. J. Surg.*, 1945, 68: 67.

Ectopia implies congenital displacement. Renal ectopia may be of several degrees and types. There are 3 general levels which the displaced kidney may occupy: the low lumbar region or iliac fossa; the brim of the pelvis; or the level below the brim of the pelvis—the true pelvic kidney. The lower the kidney, the nearer the midline it usually lies. Ectopia may be unilateral or bilateral. Both kidneys may occupy a pelvic position and be fused to form a "cake" or "shield" kidney, one of the rarest forms. The kidney may be displaced to the opposite side of the body from its natural position. Such a kidney may then be fused with, or lie distal to, the other kidney. This is crossed ectopia, fused or unfused, the former being much more common. Studies of various autopsy series indicate that the incidence of all types of renal ectopia varies from 1 in 500 to 1 in 1500 autopsies. The clinical incidence is much greater.

Twenty-three cases, 15 autopsy and 8 clinical, are reported. These were of the following types: lumbar, 3 (13.0 per cent), iliolumbar, 4 (17.4 per cent), pelvic, 12 (52.2 per cent), and crossed, 4 (17.4 per cent). Of the last, 3 were fused and 1 was unfused. There was 1 instance each of solitary pelvic kidney and bilateral renal ectopia.

Thirteen of the patients (56.5 per cent) were females and 10 (43.5 per cent) were males. In the autopsied series, renal ectopia was 13 per cent more common in females than in males (corrected for greater percentage of male autopsies).

The majority of patients seen clinically were young individuals, 62.5 per cent of whom were under thirty years of age.

The right and left kidneys were involved with about equal frequency.

In 5 cases (21.3 per cent) there were other congenital abnormalities of the ectopic kidneys, and in 4 cases there were congenital lesions of the other kidney. Three of these 9 lesions were serious.

Pain, usually in the lower part of the abdomen or back, was the chief complaint. Nephrectomy was done in 3 (37.5 per cent) of the clinical cases of renal ectopia. However, in the majority of cases, renal ectopia was apparently compatible with comfort and good health.

Urological studies should be carried out in the cases of all patients who have congenital abnormalities of the genital organs.

DONALD F. MCDONALD, M.D.

Heaney, N. S., and Kretschmer, H. L.: Pyelitis of Pregnancy. *J. Am. M. Ass.*, 1945, 128: 407.

Heaney and Kretschmer are impressed with the reduction in incidence of pyelitis of pregnancy. In the last ten years the incidence of pyelitis of pregnancy in the Presbyterian Hospital of Chicago was only 0.3 per cent. This study comprised 9,802 deliveries.

Dilatation of the kidney pelvis and ureter is not considered by them to be a major factor in this disease, in that the same authors in a previous study found dilatation on intravenous pyelography in 100 per cent of the cases seen during pregnancy and the puerperium.

The authors believe that pyelitis of pregnancy is a preventable disease, prevention consisting of measures designed to locate and eradicate foci of infection in the preparation of women for expected pregnancy.

WILLIAM W. SCOTT, M.D.

Lowsley, O. S., and Curtis, M. S.: The Surgical Aspects of Cystic Disease of the Kidney. *J. Am. M. Ass.*, 1945, 127: 1112.

The author discusses the various forms of cystic disease of the kidney, with particular emphasis on the surgical aspects, and reviews 74 cases of renal cystic disease admitted to the Department of Urology (James Buchanan Brady Foundation) of the New York Hospital, during the period from January, 1924 to April, 1944. Of these, 19 were cases of simple renal cysts, 53 of polycystic disease, and 2 of echinococcus cysts.

Simple renal cyst. The term "solitary" renal cyst is erroneous and should be replaced by the term "simple" renal cyst.

Satisfactory results will be obtained in the great majority of cases of simple renal cyst by resection of the free portion of the cyst wall, with subsequent phenolization of the base of the cyst and closure of the resultant defect with a fat pad and chromic ribbon gut. Nephrectomy is indicated in only a small percentage of cases.

Malignancy should be strongly suspected in all renal cysts containing hemorrhagic material, and, unless it can be definitely ruled out, nephrectomy should be done, as approximately 25 per cent of hemorrhagic cysts have been found to be malignant.

Polycystic renal disease. Polycystic renal disease is a congenital, probably always bilateral, and progressive pathological entity.

Surgery in this condition is pretty much limited to the complications arising from it. Much can be done in prolonging and making comfortable the lives of patients with polycystic disease by the employment of a judicious medical regimen. Nephrectomy should be done only as a life-saving measure in patients who have polycystic kidneys.

Echinococcus cyst of the kidney. Renal surgery is indicated for the great majority of patients with this disease. At operation great care must be exercised to prevent spillage of the cystic contents, since severe anaphylaxis, which is often fatal, may result,

or parasites may be implanted in the contaminated tissues. JOHN E. KIRKPATRICK, M.D.

BLADDER, URETHRA, AND PENIS

Kretschmer, H. L.: Endometriosis of the Bladder. *J. Urol.*, Balt., 1945, 53: 459.

The involvement of the urinary tract by endometriosis is uncommon, but the bladder, being in close proximity to the pelvic organs, may be affected enough so that the urologist should be familiar with this pathological condition and with the fact that the bladder may become involved.

The origin of endometriosis is difficult to explain on the basis of one theory, and evidence has been given in the literature which supports and refutes the various theories presented.

The different hypotheses advanced may be grouped broadly as follows: (1) the embryonic, (2) the metaplastic, and (3) the migratory.

Embryonic theory. The wolffian theory with respect to uterine adenomyomas was put forward by von Recklinghausen in 1896; he believed that the glandular inclusions in the uterine wall were derivatives of the wolffian duct because of the morphological resemblance between the histological structure of the adenomyoma and that of the wolffian body.

Metaplastic theory. The "serosaepithelial" theory stated by Iwanoff in 1898, and later amplified by Meyer in 1924, has such supporters as Meyer, Lauche, Witherspoon, and Meigs. This theory is based upon the fact that the entire epithelium of the female genital tract is derived from the celomic mesothelium so that, as a result of chronic irritation, inflammation, surgical trauma, or some hormonal stimulus, the serosa of the peritoneum undergoes metaplasia, changes the columnar epithelium and forms glands that resemble endometrium or tubal mucosa in appearance and function.

Migratory theory. This hypothesis assumes that the endometrial-like tissue of endometriosis has its origin in the uterine mucosa and reaches its ectopic position only by (1) invasion, (2) implantation, or (3) metastasis.

The occurrence of endometriosis of the urinary bladder is not confined to any particular age group.

Hematuria, when present during the menses, is almost pathognomonic of endometriosis, especially in the presence of frequency, dysuria, and vesical irritability, together with a pelvic mass.

As endometriosis is frequently confused with other vesical lesions, particularly malignant tumors, cystoscopic findings are diagnostic in most cases if this condition is borne in mind when the patient gives a history of cyclical symptoms.

The majority of the histories of the reported cases revealed that the patient had had one or more pelvic or abdominal operations before the endometriosis of the bladder was discovered.

Most authors agree that the induction of an artificial menopause by bilateral oophorectomy or irradiation of the ovaries is indicated in patients at or near the menopause, or if there is massive involvement of the bladder, too advanced for complete removal.

It is well known that endometriosis may become malignant, but most authorities consider this a rare occurrence. On the other hand, Sutton has remarked that aberrant endometrium has the "growth urge" as does cancer, and he questions the rarity of malignant changes. JOHN A. LOEF, M.D.

Emmett, J. L.: Transurethral Resection in the Treatment of True and Pseudo Cord Bladder. *J. Urol.*, Balt., 1945, 53: 545.

Syphilis of the central nervous system (including tabes dorsalis) is not the important etiological factor in urinary retention that it previously was believed to be. Although tabes dorsalis may produce vesical atony in many cases, obstruction of the vesical neck is present in most cases, and in considerably more than 90 per cent of the cases the vesical dysfunction can be relieved completely by transurethral resection of the vesical neck.

Urinary retention in young adults, which formerly was regarded as being due to a neurogenic bladder or atypical cord bladder, is nearly always due to congenital obstruction of the vesical neck. In some cases slight myelodysplasia may be associated with spina bifida occulta. This lesion may produce a mild type of autonomous bladder with just enough hypertrophy of the detrusor muscle to be manifest as a hyperplasia of the vesical neck. In either case transurethral resection will relieve the condition. Even though obstruction of the vesical neck is not especially apparent on cystoscopic examination, transurethral resection should be tried as the obstruction often is not apparent until after the resection is begun.

True cord bladder which results from a true lesion of the spinal cord presents an interesting surgical problem. In practically all cases the detrusor muscle is hypertonic and hypertrophied to some degree, the bladder is trabeculated, residual urine is present, and there is some type of active urinary incontinence. On the basis of the theory that the hyperplasia of the portion of the detrusor muscle around the vesical neck (so-called internal vesical sphincter) may be in part responsible for the residual urine, the possibility of transurethral resection is attractive, and the results seem to be encouraging.

Emmett and his associates have been disappointed in the use of cystometry and have abandoned its use as a diagnostic aid. They believe that more accurate information can be obtained from the patient's history, by physical and neurological examination, by determination of the amount of residual urine, and by cystoscopic examination.

Miller, J. R.: Prolapse of the Urethra Treated by the Hepburn Operation. *Am. J. Obst.*, 1945, 49: 591.

Prolapse of the female urethra is a relatively rare condition which should be observed most frequently

by gynecologists. Circular excision of the prolapsed mucosa in a manner similar to the Whitehead operation for hemorrhoids is discarded in favor of the suprapubic suspension of the urethra and bladder as advocated by Hepburn. This operation is simple and effective, and gives lasting good results; it can be performed not only in children, but also in the aged and even in the presence of marked debility.

It seems probable that the angulation of the urethra which is accomplished by this suspension procedure may have a useful place in the treatment of urinary incontinence when the urethra and its voluntary sphincter have broken away from their normal attachments to the supporting fascia near the symphysis.

The results in 4 cases are given.

EDWARD L. CORNELL, M.D.

GENITAL ORGANS

Latchem, C. W., and Emmett, J. L.: Transurethral Resection for Men Eighty or More Years of Age. *J. Urol.*, Balt., 1945, 53: 482.

Prior to the advent of modern transurethral resection, the outlook for the patient who was eighty or more years of age, and suffering with prostatism, was at best discouraging. General experience with prostatectomy for men of such advanced age was so unsatisfactory that surgeons were likely to discourage consideration of an operation.

In recent years, since the advent of successful transurethral resection, the tenor of articles dealing with this subject has changed profoundly.

Experience at the Mayo Clinic with transurethral resection in the past few years is much in accord with the experience of others. Age is no longer regarded as a contraindication to prostatic surgery, and we know now that patients of advanced age tolerate transurethral resection almost as well as younger men.

During the nine years from 1934 to 1942, inclusive, 345 patients of eighty or more years of age were treated by transurethral resection at the Clinic. Seventy-four of these patients were eighty-five or more years of age and 7 were ninety or more years of age. On admission, the value for blood urea of 76 of the 345 patients was more than 50 mgm. per 100 c.c., whereas for 20 it was more than 70 mgm. per 100 c.c. In 25 cases a vesical calculus was associated with the condition, and in 14 a tumor of the bladder was also present. Vesical diverticula were present in 13 cases.

As would be expected in a series of patients of such advanced age, the incidence of associated disease was high. For instance, 42 patients were considered poor risks for surgical procedures because of cardiac disease. Two had had cerebrovascular accidents previously and 1 had paralysis of the lower extremities. Twenty of these patients were suffering from diabetes mellitus. There were numerous other associated diseases.

The incidence of prostatic malignant lesions in this age group of cases is interesting. In 104 (30.1 per cent) the tissue removed at the time of resection was malignant. In 16 cases not included in the 104 it was believed that the prostate was definitely malignant, yet the tissue removed was reported to be benign by the pathologist.

There is no doubt that one of the greatest factors which contribute to the low morbidity and mortality of transurethral resection in this group of aged patients is the brief preoperative and postoperative period of hospitalization.

JOHN A. LOEF, M.D.

Mair, G. B.: Idiopathic Gangrene of the Scrotum. *Lancet*, Lond., 1945, 248: 464.

In a case of so-called idiopathic gangrene of the scrotum, conservative measures, including the local and general administration of sulfonamides, were adopted with a successful result. A more suitable term would be acute infective gangrene of the scrotum, since this is undoubtedly a manifestation of infection, although a variety of organisms may be responsible.

An analysis of the 240 reported cases was made from the point of view of age incidence, bacteriology, associated lesions, signs, symptoms and complications, prognosis, and treatment.

Conservative methods of treatment are sufficient unless the gangrene spreads widely, since the scrotum rapidly regenerates in uncomplicated cases.

CHARLES BARON, M.D.

Ormond, J. K., Cothran, R. M., and Singiser, J. A.: Operation for Undescended Testicle. *J. Urol.*, Balt., 1945, 53: 602.

The authors present a study of 106 operations for undescended testicle. The majority of these operations (70) were done by the elastic-band modification of the Bevan operation. In a series of 70 cases in which this type of traction was used, success was obtained in 91 per cent; in a series of 26 cases in which no traction was used 53 per cent presented successful results. The Torek technique was used in only 5 cases; therefore a statistical comparison with the Cabot-Nesbit elastic-band procedure would be of no value.

The typical traction suture operation is described in considerable detail. Reference is made to both the "infantile" and "adult" types of hernial sac associated with the undescended testicle. Hernia was encountered in 100 of the 103 cases.

WILLIAM W. SCOTT, M.D.

MISCELLANEOUS

Reynolds, L. R., and Weyrauch, H. M.: Use of Penicillin in the Treatment of Urogenital Infections. *J. Urol.*, Balt., 1945, 53: 614.

The authors outline a plan of penicillin therapy for urogenital infections. This study is based on 509 gonococcal and 26 nongonococcal infections.

Ninety-eight per cent of the gonococcal group were cured by the intramuscular administration of 10,000 units of penicillin every three hours until a

total dosage of 80,000 had been reached or exceeded. For uncomplicated cases, 100,000 units, and for complicated cases, 160,000 units are recommended. Of 21 initial failures in the gonococcal group, 20 responded to a second course of treatment. Only 1 patient required a third course to effect a cure. No patients were "penicillin-fast."

The use of penicillin proved disappointing in the treatment of "nonspecific" infections of the urethra, prostate, and epididymis. However, in coccal infections of kidney and perinephric space the drug proved invaluable. In the latter cases larger dosages were required than in the gonococcal group.

WILLIAM W. SCOTT, M.D.

Harrison, J. H., Botsford, T. W., and Trichel, B. E.: Experiences and Progress in the Treatment of Gonorrhea in an Army General Hospital Overseas (1942 to 1944). *Mil. Surgeon,* 1945, 96: 416.

The authors review 770 cases of gonorrhea treated in a general hospital overseas. Ninety-nine had been treated elsewhere and had satisfactorily passed tests for cure.

Two hundred and fourteen cases had been treated with one or two courses of sulfonamides; 150 (70.1 per cent) were cured and 64 failed to respond to the treatment.

Five hundred and twenty-one presented sulfonamide-resistant infections; 35 of these received no further treatment and were cured spontaneously; 404 received fever therapy and of these, 342 (84.6 per cent) were cured; 95 were treated with penicillin with no failures.

Of 111 patients with gonorrheal complications, those treated with penicillin responded rapidly.

Penicillin was the treatment of choice.

The criteria of cure are important; they are outlined as follows:

1. The patients must be asymptomatic.
2. The urethra must be dry for one week.
3. Urinalysis should show no cellular elements on 3 examinations forty-eight hours apart.
4. The 2-glass test should show both glasses to be clear on 3 examinations forty-eight hours apart.
5. Three smears and cultures of the prostatoseminal-vesicular secretion should show no gonococci.
6. The smears made should show no more than 10 leucocytes per high power field.

If the patient had a history of previous gonorrhea or had had sulfonamide-resistant gonorrhea, a No. 20 French sound was passed after he has been subjectively and objectively asymptomatic for a period of four days.

Cystourethroscopic examination was made in those instances in which a persistent morning drop occurs provided there was no evidence of acute or subacute genital infection.

Clinical observation alone, as has been recommended, does not furnish sufficient evidence of cure in gonorrhea. Cultures and smears of the prostatoseminal-vesicular secretion should be part of the test to determine cure whenever possible. Prostatic massage and the proper passage of a No. 20 French sound are excellent aids in evaluating the treated patient. Irritating chemicals were not instilled into the urethra as a test for cure. Gonorrhea is the greatest single cause of days lost from duty in the services. Adequate treatment and criteria of cure prevent soldiers from being returned to duty with a dormant gonococcal infection.

JOHN A. LOEF, M.D.

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS

CONDITIONS OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

Hatcher, C. H.: The Development of Sarcoma in Bone Subjected to Roentgen or Radium Irradiation. *J. Bone Surg.*, 1945, 27: 179.

Roentgen or radium irradiation sufficient to cause epithelial changes has been followed not infrequently by the development of carcinoma. Although less common than carcinoma, sarcoma in a superficial ulceration of an irradiated field is also a well known complication.

There are reports in the literature of 24 patients who developed bone sarcoma following exposure to irradiation. Seventeen of these tumors resulted from roentgenotherapy for tuberculous arthritis. One followed similar treatment for acute arthritis. In 6 cases, bone sarcoma followed exposure to radium.

Three cases reported by the author are regarded as bone sarcoma resulting from the irradiation of bone for earlier independent tumors, namely, a giant-cell tumor of the tibia, a similar tumor of the wrist, and a cancer of the breast. Two are chondrosarcomas and 1 is a fibrosarcoma with tumor cartilage.

In all of the cases reported in the literature except 1, the amount of irradiation was large and was administered in fractional doses over a long period. The interval between the irradiation and recognition of the irradiation-produced sarcoma is long. The median time in the reported cases was six years.

There is the possibility that the new tumors represent recurrence or metastasis of the original tumors. In cases 1 and 2 the initial lesions were considered to be benign epiphyseal tumors. Opposed to the idea that the subsequent sarcoma represents a regional recurrence or latent metastasis of the primary tumor is the long interval before the sarcoma was evident. In case 1, seven years, and in case 2, eleven years elapsed between the eradication of the benign tumor and the appearance of the sarcoma. Also refuting the idea of local recurrence is the fact that in each case the sarcoma developed, not at the site of the original tumor, but in previously normal bone. Latent metastasis from the original growths can hardly be the explanation, since the second tumors were clinically and histologically different from the original ones. Moreover, irradiation sufficient to destroy the first neoplasm should have destroyed any metastases in the same field. In case 3, no question of regional recurrence or latent metastasis can be raised, because the primary tumor was carcinoma of the breast and the late rib tumor a chondrosarcoma. There may be some doubt that the postoperative irradiation caused the rib tumor, since apparently relatively little irradiation was used. Also, the ribs are a common site for chondroma and chondrosarcoma, which may grow slowly and not produce symptoms for a long time. However, chest roentgenograms made at the time of mastectomy, though not now available, were reported as normal. It was probably more than coincidence that chondrosarcoma developed in a rib within the field irradiated for carcinoma of the breast.

The presence of chronic infection in all the early cases of roentgen sarcoma of bone led most of the authors to the conclusion that irradiation of chronically inflamed tissue was responsible for tumor formation. In the author's material, case 1 and case 3 showed no infection. In case 2 there was local bone infection following ulceration of the skin which was due to roentgen and radium therapy. This infected tissue was never irradiated, and the roentgen sarcoma arose in bone which had not been infected.

It is true that occasionally malignant tumors develop in chronically infected bone which has not been subjected to irradiation. These tumors, however, are usually carcinomas, developing in chronic ulcers or in epithelized sinus tracts. Sarcoma formation in chronically infected bone not exposed to irradiation is extremely rare.

One of the most interesting facts about roentgen or radium-induced sarcomas of bone is the large proportion of cartilage-forming tumors. This is true of sarcomas produced in experimental animals, as well as in human beings. Chondrosarcoma occurs more frequently among irradiation-produced sarcomas than among other bone tumors.

JOSEPH K. NARAT, M.D.

Neviaser, J. S.: Adhesive Capsulitis of the Shoulder. A Study of Pathological Findings in Periarthritis of the Shoulder. *J. Bone Surg.*, 1945, 27: 211.

Periarthritis of the shoulder has long been familiar to orthopedic surgeons. Other names applied to this condition are "frozen shoulder," "stiff and painful shoulder," "periarticular adhesions," "tendinitis of the short rotators," "adherent subacromial bursitis," "scapulohumeral periarthritis," and "Duplay's disease." The clinical picture is characterized by pain and limitation of motion in abduction, and in both internal and external rotation.

The consensus of most of the many writers on the subject may be summed up in a few pertinent statements. The condition is regarded as a separate clinical entity. Little is known of its pathological changes, and exposure of the bursa in a few instances has revealed no consistent abnormality. Motion was restored only after adhesions had been overcome. The adhesions were probably in the substance of the tendinocapsular structures.

This study was undertaken with the hope that through surgical exploration of the shoulder joint some light could be thrown on the pathology of this condition. In 10 such cases, the operative findings

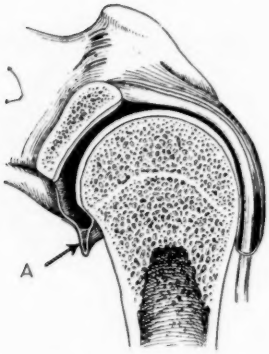

Fig. 1. A vertical section through the shoulder joint, showing the adhesion of (A) the reflected dependent part of the capsule.

were noted, and some were recorded in motion pictures as well. In addition, 63 shoulders of 36 persons who died from various causes were exposed at autopsy, and specimens were taken for microscopic study.

With 1 exception the patients selected for operation showed no changes in and about the shoulder joint upon roentgenographic examination. The exception revealed a calcification in the short rotator cuff.

The shoulders of 10 patients suffering from "frozen shoulder" or "periarthritis of the shoulder" were explored at operation. Cultures taken from these joints were negative. In 9 cases, the capsule was contracted and closely adherent to the humeral head at its anterior inferior portion. Adhesions were discernible at the reflected fold of capsule distal to the anatomical neck. In 1 case the capsule did not snap free during the manipulation, as was true in the other 9 cases, although initial inspection anteriorly revealed it to be tense. After manipulation, however, the capsule could be picked up loosely from the articular cartilage. The cause of this difference could not be visualized through the operative incision. In 1 case a tenosynovitis of the long head of the biceps tendon was observed.

The sections of bursa and capsule taken from these shoulders revealed microscopic changes in either one or both shoulders. Removal of sections of articular cartilage was discontinued, after 4 had shown a picture consistent with the usual degenerative changes from wear and tear.

The results demonstrate that the lesion is not a periarthritis, but that the essential pathological change is a thickening and contraction of the capsule which becomes adherent to the humeral head. Microscopic sections confirm the presence of reparative inflammatory changes in the capsule. In some cases there are also similar changes in the wall of the subacromial bursa. During manipulation of a "frozen shoulder" under anesthesia the capsule is separated from the head in much the same way that adhesive plaster can be torn away from the bare skin. Once this separation has occurred, motion of the head within the joint is free.

The term "adhesive capsulitis" is suggested as descriptive of the pathological change of "frozen shoulder." Case reports, photomicrographs, anatomical descriptions, and drawings are presented.

ROBERT P. MONTGOMERY, M.D.

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

Meyerding, H. W.: The Treatment of Benign Giant-Cell Tumors by Resection or Excision and Bone Grafting. *J. Bone Surg.*, 1945, 27: 196.

In 92 per cent of the 40 cases on which this article is based, the patients were between ten and fifty years of age. The history of a single injury was elicited in 52 per cent of the cases and of multiple injuries in 5 per cent. In 80 per cent the symptoms had been present for less than three years and in 58 per cent for less than one year.

Although the diagnosis of benign giant-cell tumor usually can be made on the basis of the history and the clinical and roentgenographic findings, microscopic examination is more reliable.

Curettage of a giant-cell tumor should consist of complete excision. In order to accomplish this it is necessary to have a dry field and an opening large enough so that the size of the lesion can be determined and every particle of tumor tissue removed. Complete removal is necessary. Furthermore, the surgeon must select a bone from which the proposed graft is to be obtained; usually the graft is taken from the tibia, fibula, ilium, or from a sound portion of the involved bone. Although autogenous bone grafts are preferred, homogenous grafts have been used to fill huge defects.

As hemorrhage may cause serious complications in cases in which it is impossible to use a tourniquet, the surgeon should be prepared to pack the cavity. When such a procedure is necessary, a gauze pack impregnated with petrolatum and sulfathiazole is used, and the wound is sutured in layers. The pack may be left in place for a week, and the operation may may be completed at the second stage. Massive resection of the involved bone is usually performed in cases in which the tumor is situated in the radius, ulna, or fibula. When the tumor is large and involves the tibia or femur, large bone grafts are required. In such cases, the bone struts and shavings are generally obtained from the tibia.

The best results are obtained in cases in which the cavity is packed firmly with autogenous bone, and when complete rest is assured by immobilization of the extremity in a plaster-of-Paris cast. In cases in which the tumor is situated in the region of the knee or the ankle, weight bearing should be avoided until the roentgenographic examination discloses sufficient deposition of bone to stand the stress and strain. In

those instances in which the articular cartilage is exposed, the use of supporting struts is advisable, and it is well to fill the interspaces with shavings and cancellous bone. An electric bone saw is employed for the removal of the struts, and a sharp chisel and curet are used to obtain shavings. After the cavity has been packed with bone, the periosteum is sutured whenever possible, and the wound is closed snugly in layers. Bloody drainage should be avoided, as it may lead to infection or to osteomyelitis, in which case the grafts may be lost. Frank infection did not occur in any case in this series, although several patients had serous discharge for short periods, or ulcers in incisions as a result of previous irradiation. In the past, writers have emphasized the dangers of hemorrhage, shock, and infection. Modern aseptic surgery has to a large extent eliminated these complications.

Thirty-eight of the 40 patients obtained good functional results. Three patients have died from one to seven years after the operation. None of these showed any evidence of metastasis resulting from the tumor.

Harley, G. H., and Breck, L. W.: Cellophane in Bone and Joint Surgery. *Am. J. Surg.*, 1945, 68: 229.

Three cases are presented in which cellophane was used as an interposing membrane with good results. In none of these was there any evidence of induration or foreign-body reaction. Wound healing was apparently normal.

These cases demonstrate the wide variety of conditions in which cellophane can be utilized as an interposing membrane.

Case 1. The adherent extensor tendon of the index finger was dissected free and prevented from readhering by means of a cellophane sheet placed between the tendon and the joint.

Case 2. The adherent triceps tendon at the elbow was dissected free and separated from the underlying tissue by means of cellophane.

Case 3. A radio-ulnar synostosis was removed and cellophane was interposed between the radius and ulna to prevent recurrence.

The author also describes the use of cellophane after synovectomy of the knee as reported by McKeever. DANIEL H. LEVINTHAL, M.D.

McKee, G. K.: Metal Anastomosis Tubes in Tendon Suture. *Lancet*, Lond., 1945, 248: 659.

Cut tendons show a strong tendency to unite, and although this is desirable it is prone to lead to adhesions to the surrounding tissues, even if the ends of the tendon are approximated. The more accurate the approximation the fewer the adhesions, but if any unopposed cut surface of tendon remains, a firm band of fibrous tissue will form at this site.

Accurate approximation and fixation by Bunnell's method of suture will give firm union, but the suture is a technical one and often leads to fraying of the tendon during its insertion.

With early movements, the suture is liable to give way and with early splinting, adhesions are liable to form—consequently, most of the cases, whichever method has been employed, have resulted in failures. The principle of fixation of the tendon ends until firm natural repair has taken place, and the principle of maintenance of function by active movements seem to be opposed to one another. An attempt has been made to reconcile the two by the use of a metal anastomosis tube and a two-stage procedure.

The tube into which the cut ends of the tendon can be inserted is made of fine gauge malleable noncorrosive metal. It is ½ in. long and usually 3/16 in. in diameter. It is split in its whole length so that it can be removed later, and it has several holes perforated in its sides through which sutures can be passed (Fig. 1). The tendon can be anchored within the tube by sutures passing through the perforations on one side, through the tendon in the tube, and then out through the perforations on the other side of the tube. Lately, a modified type of tube with "kick-up" spikes in its lumen has been used so as to avoid the use of sutures altogether (Figs. 2 and 3).

The tendon ends are located and then the proximal portion is pulled down as far as possible with the wrist and fingers fully flexed, and transfixed with a straight needle as far proximally as it is exposed. This seems to be the best way of holding the proximal end with a minimum of trauma; forceps are liable to cause considerable damage to the tendon. The profundus tendon is essential and this is the only one that is sutured. The sublimis tendon is cut away so as to avoid adhesions between the two. The sublimis tendons apparently give only additional strength and firmness of grip to the fingers.

In this way the tendon ends are approximated and held together in a metal tube. The straight through-and-through sutures or the projections prevent fraying of the tendon and the encasement in the tube to some extent prevents undesirable adhesions to the surrounding tissues. The tendon ends unite readily in the tube with fine linear scars, and after the tubes have been removed the union is so accurate that it is difficult to make out where the tendon had been severed. Bands of fibrous tissue actually grow out through the perforations in the tube, and these have to be divided at the second stage of the procedure, which is undertaken some five weeks later. During the first three weeks of the interval of five weeks between the two stages the finger is kept splinted in a light plaster so as to allow union to take place without any strain on the suture line.

The second stage of the procedure simply consists in exposing the tube, removing the sutures (if sutures have been used), and then opening the tube along the line of the slit, and removing it from the site of anastomosis. The adhesions that have formed around the tube are divided and the tendon is left completely free. The adhesions are often surprisingly dense, but the encirclement of metal around the tendon does keep the site of anastomosis free. The digital sheath is not sutured at all and the

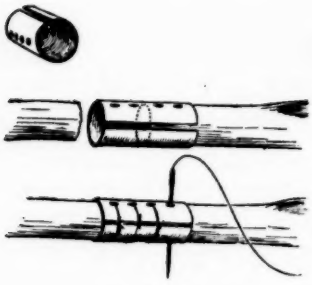

Fig. 1.

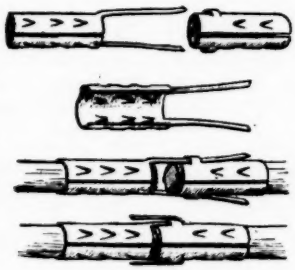

Fig. 2.

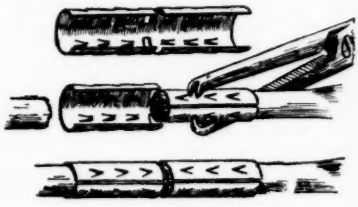

Fig. 3.

Fig. 1. The original method was to use a single split tube with perforations in it, through which sutures could be passed to anchor the divided ends of the tendon.

Fig. 2. Two split tubes have been used which can be attached to the cut ends of the tendon and remain there by reason of the small pointed projections (kick-ups) in the lumen. The two tubes can then be connected together and so hold the tendon ends approximated. This method was not very satisfactory because of the clips, which cause quite a bulge at the sides of the tube.

Fig. 3. In the latest method two short split tubes with kick-ups are connected by a narrower band. The tendon ends are simply laid in the opened tubes which are then closed around them. They remain anchored by reason of the kick-ups. In this way all sutures and clips are avoided, and the tubes are readily removed at the second stage of the operation by opening up the slit.

wound is closed by suture of the skin only. Active movements are started next day. At this stage these can be done quite vigorously, without fear that the tendon ends will come apart.

So far only recent injuries have been dealt with by this method and full passive movements of the digits were present before the operation. Six cases are reported.

Two median nerves were approximated by a similar method, the tube being used to surround the nerve, but the sutures did not perforate through the nerve; they were put in with very fine small curved needles, passed through the edges of the sheath of the nerve and then out through the adjacent perforations of the tube on the same side, and then tied outside of the tube.

Plaster casts were finally applied, and at the second stage the nerves had united well. The repairs have been made too recently to evaluate the functional response.

Stainless steel has become the material of choice because there was some discolorization of tissue adjacent to the vitalium used.

The author concludes that the results with this method have been fairly good. One of the cases of division of the flexor pollicis longus was a complete success and the other a partial failure.

The technical details may require slight modifications in the future. Probably the sutures will be dispensed with, and the split tube with little sharp points projecting into its lumen (Fig. 3) will be used instead, so as to cause the minimum of trauma to the tendon and prevent the formation of adhesions near the site of anastomosis. The ideal material has not yet been found, but further experiments are being made with various types of stainless steel and other alloys. ROBERT P. MONTGOMERY, M.D.

ORTHOPEDICS IN GENERAL

Leonard, D. W.: The Significance of Delayed Ossification in the Treatment of Congenital Clubfoot. *J. Pediat.*, S. Louis, 1945, 26: 379.

Attention has been called to the fact that delay in ossification of the tarsal bones may be an important factor in those cases of clubfoot which have been found to relapse after routine treatment for the usual length of time. An analysis of a series of roentgenograms from case records has been tabulated, and comparisons have been made by the use of a proposed ossification index for the foot. The facts thus obtained indicate that delayed ossification is present in an appreciable number of the children whose treatment has not been successful by the present conservative methods. Medication with thyroid in order to accelerate bone formation has been suggested as an adjunct to the usual routine of surgical treatment. The continued use of the ossification index during treatment has been advocated as a means of determining the need for medication, the progress under treatment, and the ultimate prognosis.

If the process of ossification in the tarsal bones holds the clue to the problems of treatment for clubfoot and if the treatment is to be thought of as, first, a correction of the deformity and, second, a period of waiting for the elements of the foot to "set" in their proper shape like cooling plastic, the individual time schedule of ossification is of primary importance. It will not be enough to say from the examination of one x-ray negative that the usual number of ossification centers is present; it will be necessary to show by repeated roentgenograms that the new centers are appearing without delay and that expansion from these centers is progressing at the normal rate.

For the normal foot the arbitrary ages for the extreme upper normal limit for the appearance of the center of ossification are:

Calcaneus	B
Talus	B
Cuboid	B
Tibia	1
Cuneiform III, lateral	1
Fibula	2
Cuneiform I, medial	3
Cuneiform II	4
Navicular	4

Each of these arbitrary figures, which admittedly are not averages, may be taken as a borderline age beyond which delay is definitely pathological.

Clubfoot appears at least twice as often in boys as in girls. It has also been shown that the rate of ossification as a normal average in boys is slower by several months than in girls. A relative slowness of normal ossification is, therefore, found coupled with a relatively greater incidence of clubfoot.

Treatment is most likely to be successful if started early in the child's life. This fact is of interest in the present study because it definitely places the optimum period for effective treatment to coincide with the period during which initial ossification of the bones of the foot takes place. The physician is faced with a notoriously variable process of ossification during a most critical stage in the treatment of clubfoot.

If repeated observations of the ossification index in a case under treatment show normal ossification, a good prognosis can be given with confidence that the deformity is not as likely to reappear after the cessation of active treatment.

Chronic metabolic disturbances, even when subclinical, will change the order of appearance and retard or alter the ossification in the centers. Of all the metabolic disturbances, those resulting from endocrinopathy are the most notable and of these, hypothyroidism has the greatest clinical significance. Wilbar concluded that calcium, phosphorus, and vitamins were important food elements in bone development.

Extensive changes in addition to delayed ossification in cases of hypothyroidism emphasize the importance of that endocrine gland. In many of these cases the bone changes reach an extreme designated as cretinoid dysgenesis. These chronic cases show evidence that after the usual delay in appearance, ossification finally develops from multiple centers within the single bone and a mottled type of ossification is the result. Under therapy with thyroid substance these abnormal areas rapidly become normal and all new centers that appear during treatment are also normal.

The fact that thyroid medication for periods as short as six months will bring about rapid normal ossification in these sites in which it is overdue may be borrowed as a basis for the medical treatment of any patient in whom delayed ossification has been discovered. Thyroid medication is then indicated. The natural fears usually associated with the use of thyroid substance in a patient with a supposedly normal basal metabolism may be dispelled by accepting the fact that delayed ossification is in itself good evidence of a lowered metabolic rate. This finding established with x-rays is, therefore, also an indication for thyroid for reasons unrelated to the treatment of clubfoot. Medical treatment for the purpose of speeding ossification in a child with clubfoot through the period when the bones are being held in their normal position thus becomes a matter of giving adequate daily doses of thyroid substance with extra thiamine chloride which this medication demands, and with the theoretical assistance of a diet rich in calcium, phosphorus, and vitamins A and D.

R. P. MONTGOMERY, M.D.

SURGERY OF THE BLOOD AND LYMPH SYSTEMS

BLOOD VESSELS

Hunter, J. B.: Ligature of the Patent Ductus Arteriosus. *Brit. M. J.*, 1945, 1: 731.

Fourteen cases, in which ligation of a patent ductus arteriosus was performed, are reported. Twelve were uncomplicated by infection, and in only 2 was endocarditis present. Ten of the patients were females. The ages varied between five and thirty-one years. In the uncomplicated cases, the patients were all slightly stunted in growth, the majority were breathless on exertion, and only 1 showed signs of cyanosis.

It is too soon to know what the ultimate result in these cases will be. All of the patients have lost their dyspnea on exertion, and have improved in general health and physique from one to three years postoperatively. The risks attendant upon the presence of an uncomplicated patent ductus arteriosus have not yet been accurately assessed, but that there is a definite risk of infection with a grave prognosis, is unquestionable.

The tying of the ductus restores the patients' circulation to normal; the breathlessness disappears; the appearance is markedly improved; and a noticeable change for the better occurs in the patients' mental condition.

The operative technique is described.

SAMUEL KAHN, M.D.

Sisson, J. H., Murphy, G. E., and Newman, E. V.: Multiple Congenital Arteriovenous Aneurysms in the Pulmonary Circulation. *Bull. Johns Hopkins Hosp.*, 1945, 76: 93.

A case of multiple congenital arteriovenous aneurysms in the pulmonary circulation is presented. The diagnosis established by angiography was confirmed at autopsy, and the pathological findings are reported.

The clinical picture of 6 reported cases is summarized. The usual symptoms are weakness, faintness and dizziness, dyspnea, chest pain, and hemoptysis. The signs are cyanosis, clubbing of the fingers, often visible hemangiomas, bruit over the chest, polycythemia, and x-ray evidence of a localized opacity in the lung. The diagnosis can be definitely established by angiography. The treatment is pneumonectomy.

A brief discussion is given of angiographic technique and the physiological effects of pulmonary arteriovenous communications. Angiography has proved a useful procedure but may be dangerous in a patient with a circulatory shunt from right to left heart.

A clinicopathological analysis is made of 12 previously reported cases together with the authors' here reported in which death occurred within one hour of the intravenous injection of diodrast for diagnosis. The conclusion reached is that the intravenous use of diodrast should be approached with caution in the case of patients with hypertensive cardiorenal disease. JOHN E. KIRKPATRICK, M.D.

Hodge, G. B., Grimson, K. S., and Schiebel, H. M.: Treatment of Varicose Veins by Stripping, Excision, and Evulsion. *Ann. Surg.*, 1945, 121: 737.

High saphenous ligation, vein stripping, and either excision or evulsion of the veins, with pressure bandages and early activity, have proved effective in the treatment of a group of patients with advanced pathological changes associated with large varicose veins. They were more effective than ligation and injection therapy used earlier in patients with similarly advanced pathological changes. Although the operation exposed large areas of skin, and was often carried out in the presence of open ulcers, the rate of infection was low.

Pressure bandages and early activity may account for the absence of pulmonary embolism or deep vein thrombosis.

The appearance of new small varicosities in one-half of the patients within a short period suggests that some defect of the remaining veins or abnormality of circulation must still exist.

SAMUEL KAHN, M.D.

Smithy, H. G.: Complicating Factors in the Surgical Management of Varicose Veins. *Surgery*, 1945, 17: 590.

Smithy points out that successful treatment of varicose veins of the legs depends upon complete obliteration of the principle components of the superficial venous circulation, and emphasizes that the best results are obtained only by radical technique. High ligation and division of the saphenous vein combined with retrograde chemical sclerosis are essential. He advocates the method suggested by Pratt, by which a ureteral catheter is passed down the distal venous segment for from 40 to 60 cm. The sclerosing agent is injected continuously as the catheter is withdrawn.

He discusses the various complications and illustrates them with case histories. These are anatomical variations, extreme tortuosity in which catheterization is difficult, thrombophlebitis, lymphangitis and cellulitis, varicose ulcers, and postoperative venospasm.

Reactions to sclerosing agents are also discussed.

BENJAMIN GOLDMAN, M.D.

O'Neil, E. E.: Ligation of the Inferior Vena Cava in the Prevention and Treatment of Pulmonary Embolism. *N. England J. M.*, 1945, 232: 641.

The interruption of deep venous pathways in the treatment and prevention of pulmonary embolism has come to be a generally accepted surgical pro-

cedure. The preferred sites for division have been the superficial femoral veins, the common femoral veins, and, in a few cases, the external and common iliac veins. It must, however, be pointed out that there have been occasions when embolism, in a few cases with a fatal result, has occurred after bilateral division of the deep veins. The reasons for these fatalities are not always clear.

In certain selected cases, therefore, it may be pertinent to interrupt the inferior vena cava to circumvent the possibility of just such a catastrophe.

There appear to be two distinct indications for ligation of the inferior vena cava that have been encountered in a large series of divisions of deep veins; the first exists when the diagnosis of phlebothrombosis is obvious and the site of the lesion is apparent; the second exists when one or more emboli have occurred but their source is obscure.

In ligation of the inferior vena cava several considerations present themselves: (1) the pattern of the collateral circulation that follows on such an interruption; (2) the operative procedure; and (3) the state of the venous return from the legs after occlusion of the vena cava.

Regarding the first, the collateral pathways available after ligation of the lower vena cava fall roughly into three groups—the superficial, the deep, and those of the ascending lumbar trunks. The first of them comprise the superficial circumflex iliac and the superficial epigastric veins, which connect the saphenous system with the superficial thoracic vein and the veins of the upper abdominal wall. The deep pathways are formed by the anastomosis of the deep circumflex iliac, superior epigastric and lumbar veins, which connects the external iliac veins with the internal mammary and ascending lumbar veins. The ascending lumbar trunks begin in the pelvis on either side of the promontory of the sacrum and communicate with the sacral, common iliac, hypogastric, and iliolumbar veins. As they ascend they connect with the lumbar veins, the inferior vena cava, and the right renal vein. The right lumbar trunk becomes the azygos vein and terminates in the superior vena cava; the left continues as the hemiazygos vein and eventually enters the right azygos vein.

In the operative procedure one of two incisions may be employed. The first is that customarily used in exposing the right iliac vessels, and is made approximately parallel to the inguinal ligament extending laterally toward the flank. After retraction of the peritoneum mesially, the right common iliac vein is clearly brought into view; further retraction upward and inward discloses the lower inferior vena cava. The alternate incision is placed higher up in the flank. It is the approach usually employed in the operation of lumbar sympathectomy. It gives ready access to the vena cava, and appears to be the preferable route. If troublesome bleeding is encountered, the better exposure rendered by the lumbar incision makes control of such a complication less difficult. Also, little manipulation is required in tying off the vena cava through this incision, a consideration if much thrombus is present in the iliac vessels. Actual ligation of the vena cava is done with two heavy braided-silk ligatures placed about the vessel 2 or 3 cm. apart. Caution should be used when placing these ligatures in the region of the lumbar veins. These veins, four in number, on either side of the lower vena cava may easily be injured in the maneuver of sliding the ties under the main venous trunk. It is necessary neither to open nor to divide the inferior vena cava. If a thrombus is contained within the vessel, not enough will be detached to be dangerous. Ligation will serve the purposes of interruption equally as well as division.

The determination of venous pressures in measuring the status of venous return from the legs, following ligation of the inferior vena cava, is probably of considerable value. It is apparent that venous pressure is considerably raised following occlusion of a main venous trunk, without, however, causing any undue effect on a normal heart muscle. If pressure in the great veins becomes excessive, the heart muscle responds by contracting more vigorously, propelling more blood into the arterial tree and thereby lowering the venous pressure and maintaining it at a normal level. It is thus evident that venous pressure should return to normal quite rapidly after interruption of the vena cava. Theoretically, in cases of advanced age with failing myocardium, caution should be used in ligating the inferior vena cava.

Clinically, both the immediate and the remote effects of caval ligation are satisfactory. Minimal discomforts, such as heaviness, numbness, and moderate swelling, have been observed by patients, but they have not been of sufficient magnitude to interfere with usual everyday duties. Edema of the legs, which at first thought seems to be of outstanding importance, is not so frequent or so pronounced as after division of the femoral vein, and with the passage of time usually clears up.

STEPHEN A. ZIEMAN, M.D.

BLOOD; TRANSFUSION

Hurtado, A., Merino, C., and Delgado, E.: Influence of Anoxemia on the Hemopoietic Activity. *Arch. Int. M.*, 1945, 75: 284.

Investigations were made at sea level and at high altitudes in several series of healthy and diseased male subjects, concerning the influence of temporary, intermittent, and chronic anoxemia on the morphologic and other characteristics of the circulating blood. Exposure to a low barometric-pressure environment caused in most cases a polycythemic response. There seems to be a limit for the hematological response to the anoxic stimulus; when this is very severe a decrease, rather than a further increase, is observed in the resulting polycythemia. The level of hemoglobin in the circulating blood may be considered as one of the many factors which tend to preserve the internal stability against the dis-

turbing influence of a constant lowering of the oxygen tension in the inspired air.

The polycythemia associated with the anoxemia of high altitudes is absolute in type. The elevation in the total blood volume is due to an increased red-cell volume. The polycythemia observed on arrival at high altitude seems due to factors of release of stored blood and hemoconcentration while that corresponding to a repeated or constant exposure to a low pressure environment is related to a erythropoietic hyperactivity.

The polycythemia associated with a constant or intermittent anoxemia tends to show a proportional elevation in the circulating reticulocytes and in the serum bilirubin. The stimulating influence of anoxemia on the hemopoietic system is restricted to the formation of red blood cells and hemoglobin. Chronic anoxemia does not modify the erythropoietic activity permanently.

Comparative study of the polycythemia of high altitudes and that observed at sea level indicates that in cases of the latter due to pulmonary changes the polycythemic response tends to be less than with corresponding degrees of arterial oxygen unsaturation at high altitudes, except in cases of Ayerza's disease. Such comparative studies also suggest that the causative mechanism of polycythemia vera is not related to the existence of an anoxic stimulus.

WALTER H. NADLER, M.D.

DeGowin, E. L.: The Possible Role of Whole-Blood Transfusions in Military Medicine. *J. Am. M. Ass.*, 1945, 127: 1037.

Since the introduction of sodium citrate in 1914, civilian medicine has steadily increased its use of whole blood until it is commonplace in most hospitals. Blood has become more readily available through the development of blood banks and it is commonly believed that due to its use, chronic anemias are improved, preoperative anemic patients withstand operations better, some infections are combated, and shock from severe hemorrhage is overcome.

Since 1938 attention has been directed to the therapeutic possibilities of plasma and serum transfusions. These plasma transfusions are effective in the treatment of hypoproteinemia and of secondary shock; they are also employed in immunotherapy. There are many conflicting theories concerning the origin of secondary shock, but nearly all agree that the important treatment is to restore the circulatory blood volume. Whole blood will do this, but many workers now say that this beneficial effect is due entirely to the plasma components and that the erythrocytes are unnecessary and an unstable and dangerous element. Plasma possesses the advantage over whole blood of being more stable for storage and not requiring compatability tests prior to administration.

With the military necessity of treating secondary shock on a large scale, many opportunities for comparing methods of therapy arose, and it soon became apparent that the methods which were efficacious in civilian practice were not necessarily applicable in warfare. In civil practice the degrees of shock are mild or moderate, and treatment can usually be instituted promptly, but in war the degree of shock is often much greater, since a longer time elapses before treatment is started. Failure to recognize this probably accounts for the early conclusions that all patients with hemorrhagic shock could be treated exclusively with plasma or serum.

It is now becoming evident that there are several distinct clinical types of secondary shock—one in which hemoconcentration occurs, as is seen in burns and crushing injuries, and another in which no hemoconcentration occurs, as in shock associated with hemorrhage. Serum and plasma will restore the circulating volume in both types, but if the blood loss has been great, there is a tendency toward relapse unless whole blood has been administered. British, after treating air-raid casualties, concluded that 1 pint of blood should be given for every 2 pints of serum or plasma—an observation subsequently confirmed in the American forces.

In civilian practice at the University of Iowa Hospitals, an 800-bed general hospital with a blood bank having quantities of whole blood and plasma available, one can gain some perspective into the indications for whole-blood transfusions. In one year 3,618 transfusions were administered—of which 3,358 were whole blood and 260 plasma. Only the indications for each transfusion were considered and not the availability. It may be possible to predict the indications for whole blood and plasma in an active military installation from this experience because more patients will be undergoing major surgical procedures and the incidence of secondary shock will be greater. In military medicine, 90 per cent of the secondary shock cases are caused by hemorrhage, a condition preferably treated by whole blood.

Frequently in warfare, there are many practical limitations to be faced. The ease of administration, stability, and universal compatability of blood plasma are well known. These features make its use the preferable treatment of secondary shock in many military situations; often it is a question of plasma or nothing. Whole-blood transfusions are not practical in many military situations because of the time required to collect blood, the lack of adequately trained personnel and equipment, and the difficulty in procuring donors.

Employment of the following three procedures has made possible the application of whole-blood transfusions in military medicine; (1) the accumulation of large stores of preserved blood, (2) the transportation of preserved blood, and (3) the administration of group O blood to recipients belonging to any of the four blood groups.

Anyone working in a civilian hospital with a blood bank with large supplies of whole blood instantly available recognizes the advantages and the potentialities in time and life saving. These advantages are multiplied many times in an advanced military

establishment where surgical operations are performed on seriously wounded men by a limited personnel.

Transportation of preserved blood now is limited only by the distance attained by airplanes in the maximum time of preservation of the blood. The United States Army was maintaining a daily transport system of type O blood from our east coast to the European theater of operations.

Ottenberg in 1911 proposed the "universal donor" principle and considerable controversy about its safety has been aroused. Rarely a blood of group O may contain agglutinins of such potency to react with a recipient of a heterologous group. Thousands of transfusions of O blood have been given to recipients of other blood groups in civilian and war practice without an alarming incidence of reactions. This is an immense advantage in military medicine. The group of the blood can be determined at the point of collection by well trained technicians and then it can be employed as indiscriminately as plasma at the point of administration without the delay, equipment, or personnel required for the laboratory tests. Not only is this a time saver, but also it is safer than to trust compatability tests done under the pressure of urgency which frequently surrounds the emergency transfusion of blood.

Military organization must solve certain new problems in handling preserved blood in addition to the problems of supplying plasma to medical installations. Collecting depots must be established far enough in the rear to insure an adequate donor supply and to be equipped with facilities for adequate blood grouping. Refrigeration must be provided at the collecting depots, during transportation, and at the dispersal points; accurately timed and frequent transportation facilities must be maintained. However, now that these problems are being solved by the American army, it is now possible to employ preserved blood of group O in the same manner as plasma, administering it in foxholes, on ambulances, aboard ship, and in the air.

ROBERT R. BIGELOW, M.D.

Thalhimer, W., Taylor, E. S., and Shaub, T. S.: The Transfusion of Centrifuged Human Type of O Cells Resuspended and Stored in 10 per cent Corn Syrup. *J. Am. M. Ass.*, 1945, 127: 1096.

Resuspended red blood cells, left after citrated blood has been centrifuged and the plasma withdrawn, have been stored in 10 per cent corn syrup at 5°C. for as long as twenty-one days and administered with satisfactory results to 437 patients (for routine use an expiration interval of fourteen days has been established).

Jaundice or any other deleterious effect has not occurred and the nonspecific fever-chill reaction rate has corresponded in the different hospitals to that from their own bank blood.

These centrifuged cells were found, by Ashby's agglutinating technique, to survive as well and as long in the recipient's circulation as whole blood in a dextrose-citrate mixture which has been stored for the same length of time, and longer than cells in an isotonic solution of sodium chloride.

When only the red cells are needed, the clinical results also indicate that a transfusion of centrifuged cells resuspended in 10 per cent corn syrup is as satisfactory as a transfusion of whole blood.

JOHN W. BRENNAN, M.D

Muether, R. O.: Concentrated Red Blood Cells; Preparation and Use. *South. M. J.*, 1945, 38: 330.

As a result of the increased demand for plasma, blood banks have been left with large quantities of erythrocytes which have been discarded. This has resulted in a 50 per cent loss of the total material collected. Attempts to utilize this material have resulted in the development of several new techniques:

Utilization of erythrocytes

1. Red blood-cell suspension
   a. Dilute—cell count equals that of whole blood
   b. Concentrate—cell count doubles that of whole blood
2. Red blood cells as surgical dressing
   a. Red cell sludge
   b. Dehydrated cells (powder)
   c. Ointment

Red-cell suspensions are those in which the red blood cells are resuspended in saline solution to a concentration approximating that of whole blood.

Concentrated cell suspensions are those in which the red cells are present in approximately double the number found in whole blood.

These suspensions are used as dressings for wounds or ulcers.

Cells used for this last purpose may be prepared in one of three ways: (1) a sludge which is painted on the wound; (2) the cells are dried by lyophilization and used as a dusting powder, or (3) the cells are incorporated in an ointment base. Tragacanth and hexylresorcinol have been used as a base by Murray and Shaar.

The preparation of the red cells for surgical dressings is relatively simple. It consists in removing the plasma from the cells and then drying them by a process devised in the author's laboratory and representing a modification of the current procedure used for this purpose. The particular arrangement used allows the complete drying of 350 c.c. of cells in approximately four hours and makes it possible to dry two such amounts in one working day; or by multiplying the apparatus, which is sufficiently simple in construction to permit duplication, one may dry considerable quantities daily. The powder has been found very satisfactory as a dressing or as a 25 per cent ointment in a special base consisting of the following:

Cetyl alcohol	15.0 gm.
White wax	1.0 gm.
Propylene glycol	10.0 gm.
Sodium lauryl sulfate	2.0 gm.
Water	72.0 gm.

BENJAMIN GOLDMAN, M.D.

Strumia, M. M., Chornock, F. W., Blake, A. D., and Karr, W. G.: The Use of a "Modified Globin" from Human Erythrocytes as a Plasma Substitute. Preliminary Report. *Am. J. M. Sc.*, 1945, 209: 436.

Hemoglobin derived from packed erythrocytes left over from the preparation of plasma can, by a relatively simple process, be transformed into a "modified globin" at a fraction of the cost of plasma production. From a blood donation it is possible to obtain 250 c.c. of plasma (about 17 gm. of plasma proteins) and about 24 gm. of globin. This globin is equivalent in osmotic power to about 600 c.c. of plasma and has the osmotic equivalent of about 4 blood donations.

Although the properties of the modified globin have not, as yet, been fully investigated, it has been ascertained that this material is safe and capable of replacing lost blood volume in patients suffering from severe secondary shock. WALTER H. NADLER, M.D.

Young, L. E., and Kariher, D. H.: Hemolytic Transfusion Reactions Due to Rh Incompatibility. *J. Am. M. Ass.*, 1945, 127: 627.

The authors state that routine crossmatching of the donor's cells with the recipient's serum for demonstration of acquired isoagglutinins is inadequate. Three cases are presented in which hemolytic reactions were due to acquired sensitivity to the Rh factor. Crossmatching had been carried out by the test-tube centrifuge method, first at room temperature and later at refrigerator and body temperatures, without the detection of incompatibility. This inability to predict intragroup reactions is due to the fact that many times the acquired Rh antibody is not demonstrable by in vitro tests. The cases presented in this report prove that sensitivity was retained nearly eight and sixteen years, respectively, after the last immunization by pregnancy.

Hemolytic reactions occurring during pregnancy or the postpartum period are due to the development of Rh antibodies in Rh-negative women who are carrying, or have recently given birth to, Rh-positive children. The danger of transfusing such women with Rh-positive blood is not fully realized. Rh-negative children were found in each of the three families presented, which indicated that each of the three fathers was heterozygous with respect to the Rh factor.

Anti-Rh agglutinins can be demonstrated in less than half of the Rh-negative mothers of children with hemolytic disease of the newborn. They usually disappear within six months to two years, but have been found as late as six years after pregnancy. All such mothers are presumably immunized against the Rh factor and may have and maintain tissue sensitivity when the antibodies cannot be detected in the test tube.

The authors note that in the majority of instances Rh incompatibility cannot be predicted by any sort of in vitro test thus far devised. Wiener's biological test is a more sensitive indicator of Rh incompatibility. Kouchy states that Rh-negative pregnant or puerperal women may be given Rh-positive blood provided this test is negative. Hemolytic reactions due to Rh incompatibility may be delayed beyond the test period of one or two hours and be missed, particularly in patients whose last immunization by the Rh factor occurred many years prior to the transfusion.

Kouchy suggests that Rh-negative individuals may be transfused with Rh-positive blood if the transfusion program can be completed within a period of five or six days before antibodies can develop. Although this practice may result in few severe reactions, the authors point out that even the first Rh-positive cells given to an Rh-negative person of either sex may survive for a relatively short period in the patient's circulation. A more serious objection is that the injection of Rh-positive blood into an Rh-negative individual at any time may produce lifelong sensitivity to the Rh factor.

The authors state that the only safe plan for the prevention of intragroup hemolytic reactions is that of giving only Rh-negative blood to all Rh-negative individuals. The policies of the Strong Memorial Hospital and the Rochester Municipal Hospital, both of Rochester, New York, are given in detail.

In conclusion, the authors note that the occurrence of hemolytic transfusion reactions due to Rh incompatibility in 3 women emphasizes the following points: (a) serious hemolytic reactions may follow transfusion without causing chills, fever, or other dramatic symptoms or signs; (b) sensitivity to the Rh factor, once it is acquired, may persist for many years, probably for life; (c) Rh incompatibility is often unpredictable by any sort of in vitro matching test. The prevention of such reactions consists only in always giving Rh-negative blood to Rh-negative patients. The study of reactions involves not only the rechecking of the groups and crossmatchings but, in addition, the chemical examination of the blood and urine, as well as the determination of the survival of the transfused red blood cells.

HERBERT F. THURSTON, M.D.

RETICULOENDOTHELIAL SYSTEM

Cooley, T. B.: A Severe Type of Hereditary Anemia with Elliptocytosis. Interesting Sequence of Splenectomy. *Am. J. M. Sc.*, 1945, 209: 561.

The author reports a severe type of hereditary anemia observed in 2 brothers. The family history in the five generations of record indicates that the disease is transmitted by unaffected females in the "sex-linked" manner of hemophilia, or the "sex-influenced" manner of pattern baldness, between which it is not possible to distinguish on present information. Throughout the five generations, 19 of 29 boys born to women in the mother's line of descent developed a severe anemia. Of these, 16 died, 10 in their first year; 1 is said to have recovered and the 2 others are the patients whose cases are reported in this article. No girls have been affected.

Both brothers exhibit a striking type of elliptocytosis, which was not found in any of the numerous siblings nor in either parent.

Of the 2 patients, Jerome, born March 15, 1935, is the more seriously affected, since he is susceptible to respiratory infections which seem to cause exacerbations of the anemia and make frequent transfusions necessary. Robert, born June 23, 1931, has never shown indications of serious illness, but lives comfortably on an average hemoglobin of about 7 gm. He was supposed to be in normal health until brought in with other children for blood studies. Most of the data obtained from the study of these patients come from the observations on Jerome, with Robert serving for comparison.

When first seen by the author in April, 1941, Jerome, who was then six years of age, seemed definitely stunted, weighing less than 40 pounds and exhibiting the pallor of a severe anemia without jaundice. He had a slight "hemic" murmur; the spleen was neither palpable nor enlarged to percussion, and there was no indication of liver enlargement. Lymphadenopathy was not present. X-ray films of the skeleton showed nothing remarkable. Results of blood studies showed: hemoglobin, 3.4 gm; red blood count, 3.53 million; marked fragmentation; extreme hypochromia; fragility, from 0.48 to 0.20 (wide resistance span); quantitative uroglobin, 0.69 per cent; no reticulocytes were seen. More than 50 per cent of the erythrocytes were elliptical. The white-cell count was 5100, with normal differentials. The urine and stools were negative.

A blood study of Jerome was undertaken about the same time that one was made of Robert, as well as of 6 of 8 siblings, 4 brothers and 2 sisters. All but Robert had normal blood, with regard both to anemia and to the presence of elliptocytes. Robert's blood smear resembled Jerome's so closely that it was almost impossible to distinguish between them, although his hemoglobin was 6.6 gm. and there was not such marked fragmentation as in the case of the younger brother. Robert's bilirubin was 0.41 per cent. The blood of both boys showed a marked tendency to be microcytic and hypochromic. Each of the boys has had periods of polycythemia with counts above 6,000,000.

The erythrocytes in the blood of these two boys presented special characteristics and differed somewhat from the erythrocytes illustrated in other case reports of "elliptocytic anemia." The so-called "sausage" cell, of which there was a high percentage, seemed to be the most noticeable form. "Pencil cells" were not prominent, nor was the division by median fission so marked as in some types of elliptocytes. A very striking characteristic of the cells in the blood of both boys was the prominence of the "signet-ring" appearance. This was due to an appearance of hemoglobin deposition at the periphery of the cell, with complete absence of stain in the center. This characteristic together with the behavior of the blood counts, and the knowledge that there was ample available iron, led the author to believe that the cause of the anemia lay in an inability to synthesize hemoglobin beyond a certain point. Another characteristic was a tendency toward polycythemia which was noted in several other reports of elliptocytosis and implies a pronounced microcytosis. During a period of observation covering more than three years on these two boys, Robert has had a number of counts around 6,000,000 and one of 6,500,000, with hemoglobin in the neighborhood of 7 gm. The highest count for Jerome was 6,550,000 with hemoglobin of 6.9 gm. Another feature was a wide resistance span, that is, increased maximal resistance with normal or decreased minimal resistance, without the appearance of target cells, which have been supposed to be an explanation for it.

A sternal biopsy was performed on Robert. The pathological report described a cellular marrow in which no abnormalities were observed in cells in the erythroblast or normoblast stages. The mature erythrocytes were often peculiar in appearance with many elongated and needle-shaped forms. There was also marked variation in the size of the erythrocytes, and most of the cells which were not needle-shaped or elliptical in sections appeared unusually small. The main abnormality appeared to lie in the appearance and shape of the mature red cells. No anomalies could be demonstrated in the nucleated precursors of these cells. This finding coincides with the observation reported by several writers that the erythrocytes do not assume the elliptical form until just before entering the circulation.

Numerous diagnostic and therapeutic tests were tried in the study of Jerome's condition, which was clearly a microcytic, hypochromic anemia of a type which ordinarily would be expected to respond to iron therapy, or perhaps to iron and liver. These substances, given singly, and in various combinations, elicited no response. In order to eliminate the possibility of failure of iron absorption, intravenous injections of colloid iron were resorted to, but these likewise had no more effect than the oral administration. A determination of the boy's serum iron was made and found to be high, with a value of 0.246 mgm. per 100 c.c. The normal average for humans is from about 0.060 to 0.180. This high serum iron seemed to indicate that there was inability to synthesize hemoglobin from iron in the bone marrow. This finding further substantiated the conclusion that there was a form of hypoplasia involving almost exclusively the hemoglobin synthesis. Tests for other possible reasons for an anemia of this type all gave negative results.

In considering possible causes for such a hypoplastic state, the author came to regard the spleen as a possible factor, since a number of writers have suspected the spleen of exerting an inhibitory effect on marrow function in the presence of various diseases. As the patient was losing ground and all other therapy had proved futile it was finally decided to resort to splenectomy on May 25, 1943.

The spleen was found to be very large and tied firmly by adhesions under the dome of the dia-

phragm. This explained why on examination it had been impossible to detect the enlargement by palpation or percussion. Moreover, it had caused surgical difficulties which made it impossible to obtain blood specimens from the splenic vein. The spleen weighed 336 gm. (average normal, 69 gm.). No marked variation from normal was apparent in the architecture, nor was there any increase in fibrous tissue. The pathological report indicated extramedullary hemopoiesis and hyperplasia of the spleen. The material suggested formation of red cells which were deficient in hemoglobin as well as abnormal in shape with a tendency to be fragmented in the spleen.

The immediate effect of the operation was rather surprising. A temporary rise in hemoglobin of brief duration manifested itself. This was probably due to the massive transfusions given preparatory to operation. The unexpected result was a definite tendency toward diminution of the proportion of elliptocytes to round forms, and an apparent increase in the number of pale blue-staining cells without hemoglobin. Both of these tendencies were noted almost immediately after the operation and continued to appear. Three and a half months after splenectomy blood studies showed many round cells without hemoglobin and a remarkable number of Howell-Jolly bodies. After this time a period of apparent improvement in the appearance of the cells ensued. A blood study made nine months after splenectomy seemed to show a fairly high percentage of cells with a reasonable amount of hemoglobin, contrasted with the cell shadows still to be seen.

The author believes that the striking change in Jerome's cells was due to the splenectomy. Nothing similar has ever been noted in Robert's blood. There seems to be evidence that the operation influenced favorably the fundamental disease process. If by suitable prophylaxis the infectious element can be minimized, it is possible that something approaching a cure can be looked for.

The author discusses the probable relation of the elliptocytosis to the anemia in these cases. The elliptocytes described are unquestionably pathological, but they are not to be construed as "poikilocytes" in the proper sense of that term. Elliptical cells are frequently seen in blood showing marked poikilocytosis, together with misshapen cells of many other forms. In this instance they are the only conspicuous example of deformity. At times the suggestion has been made that elliptocytosis may be an effect rather than a primary element of the anemia. The return of many cells to the round form after splenectomy might be considered as evidence for this view if one were a subscriber to the plausible theory advanced by Dameshek and others, that some splenic effect is responsible for the spherocytes of hemolytic anemia. In that case one could account for the two wholly different types of cells in Jerome's later blood pictures by supposing that the hematopoietic apparatus of the whole body was involved in the process and that removal of the spleen remedied only that part of it. This explanation offers a reasonable analogy to what is occasionally observed in other conditions which are benefited but not finally cured by splenectomy.

The author calls attention to the fact that this anemia adds one more to the list of the "refractory" anemias which are uninfluenced by any form of therapy, except occasionally splenectomy; and it is noteworthy that all these refractory anemias are due to fundamental constitutional defects in the hematopoietic system. Other examples are sickle-cell anemia, Mediterranean anemia, and a familial anemia reported by Strauss and Daland.

MATHIAS J. SEIFERT, M.D.

SURGICAL TECHNIQUE

WAR SURGERY

Harris, R. I.: War Wounds; The Present Status of Their Treatment. *Canad. M. Ass. J.*, 1945, 52: 450.

Infection is the distinctive problem in war wounds. The first important contribution to wound treatment made between the two World Wars was the control of infection due to hemolytic streptococci. Since these organisms were secondary invaders, which always came from the nose and throat, either directly or indirectly, infection by them could be prevented by appropriate dressings or by early closure of the skin. Part of the merit of Winnett Orr's closed plaster treatment was due to the exclusion of secondary infection. Second in importance was the introduction of sulfonamides. The third contribution was Trueta's closed plaster technique, which applied Winnett Orr's method of treating osteomyelitis to the treatment of war fractures. This technique not only excluded secondary infection but also enhanced the development of local defense barriers by splinting of the soft tissues.

In this war, penicillin has been found to be a magic aid. The essential features of the management of war wounds now are:

1. Early and adequate débridement. The wound is enlarged by longitudinal incisions which relieve tension, and provide adequate exposure. All devitalized tissue and foreign material is removed. Perfect hemostasis is secured.
2. Drainage is provided by inserting vaseline strips into the depths of the wound.
3. Fractures are reduced by manipulation. Steinman pins or Kirschner wires are inserted if necessary.
4. Plaster is applied—it should cover the wound and its dressing completely.
5. Penicillin and sulfonamides are administered early and continuously.

With such methods, it has been possible to close about 80 per cent of the wounds within two weeks of the wounding, and to have the great majority of these heal by primary union, and remain healed.

SAMUEL KAHN, M.D.

Edwards, H. C.: Revival of Early Wound Closure; Two-Stage Operation as Applied in Italy. *Lancet*, Lond., 1945, 248: 583.

In Italy in the closing phases of World War II, treatment of the débrided wound by delayed closure was practiced as a routine procedure, primary suture being reserved for wounds of the face and scalp. The term "two-stage operation" has been used to describe the process, and although it is open to objection as having a flavor of propaganda, it has been all the more useful in the field because it is something of a slogan. Moreover, it is justified by the following facts:

When a missile enters the body, not only does it provide transport for pathogenic organisms picked up as it passes through the skin and clothing, but by damaging the tissues it creates an ideal home for these organisms. The object of early surgery is to wreck this home and make it inhospitable. The forward surgeon does this by removal of clot and foreign bodies, by excision of grossly contaminated and devitalized tissue, and by providing for unimpeded drainage through free incision of the skin and fascia. He will further increase the inhospitability of the wound by using a bacteriostatic. The success of this initial operation will be apparent in from two to four days; if there are then no signs of acute inflammation in the wound or around the wound, the object of the operation has been achieved.

After the desired result—a wound which has resisted attack by the organisms originally introduced—is obtained, the next obligations are to get the wound healed in minimum time and to prevent reinfection. These obligations are, of course, closely related. Both may be fulfilled by closing the wound, which may safely be done when there are no signs of inflammation. Nothing indeed can now be gained by leaving the wound open, and much may be lost. The presence of a fracture is no contraindication; on the contrary, it makes early closure even more desirable.

Thus, the whole operative procedure may be conceived as one operation performed in two stages—a preliminary débridement to guard against sepsis, with a waiting period to determine its success, and suture preferably between the third and fifth days.

From the pooled experience of senior surgeons who had served with both the Eighth and First Armies, a set of "rules" was drawn up:

1. Débridement of wounds at forward units must be thorough.
2. The dressing on a wound must not be disturbed during evacuation from forward units to base hospitals unless the indications for doing so are absolute.

As one surgeon put it, inspection means infection. This is the rule which has been hardest to enforce; changing a soiled for a clean dressing is a natural impulse, difficult to resist. That insistence upon this rule is justified has recently been shown by Lieutenant Colonel Bentley and Major Scott Thomson, who found that 48 per cent of 163 wounds dressed during evacuation were infected with pathogens, as against 33 per cent of 610 undisturbed wounds.

3. The first dressing must be done under aseptic conditions in the operating theater, the optimum time being from three to five days after the initial operation.
4. The wound must be closed at once if it looks suitable, bacteriological examination being ignored as a criterion for closure.

5. The patient must be retained in the hospital until the sutures are removed.

This last rule is of considerable importance. In a small series of cases of delayed suture evacuated from hospitals in eastern Italy to hospitals in western Italy after the battle of the Gothic Line, there was a high proportion of failures.

The opportunity to carry out delayed primary suture on a large scale came at Cassino, the D-day for which was May 11. No better opportunity could have presented itself, for the medical arrangements in this battle were probably as favorable to the outcome of surgery as those of any campaign in history. Forward base hospitals were only a few hours away from the front line, and beds were adequate in number. During the seventeen days from May 15 to May 31, flesh wounds in 1,032 patients were repaired between the third and sixth day of wounding in eighteen different general hospitals. Of 640 cases, irrespective of what bacteriostatic was used, 539 (84 per cent) were healed by first intention within twelve days. Of 951 cases, 877 (91 per cent) were adjudged to have been at least 90 per cent successful. Of 234 wounds in which penicillin was used in both stages of the operation, 209 (89 per cent) healed by first intention.

With experience, surgeons became bolder and the number of wounds denied suture decreased. To the rules first enumerated some refinements were added. Immobilization during transit is one of them. A plaster splint is now applied to all limb wounds during evacuation, whether or not a fracture is present. This has the added value of deterring those tempted to disregard the veto on inspection of wounds. The stimulus to forward surgery afforded by early closure has been considerable. Surgeons at forward units have lost any reluctance they may have had to making adequate skin incision for exposure of the deeper structures, because they know that within a few days their incisions will be closed by their colleagues at the base. And the excellence of the forward surgeons' work has given increasing confidence to the surgeons at the base in their powers of repair.

Penicillin, like all other bacteriostatics, is the handmaiden of surgery. It in no sense replaces it. Rather should it stimulate surgeons to be even more meticulous with their technique. Given reasonable conditions and the aid of penicillin, they should then approach within a measurable distance of 100 per cent success in the two-stage operation.

The technique favored by different surgeons differs considerably, although the differences are mere variations on a theme. The patient is not taken to the theater till the day after admission to the base hospital, so that a night's rest is assured. The dressing is then removed with aseptic precautions, and, unless contraindications make suture impossible or imprudent, pentothal anesthesia is induced.

Superficial wounds which have been adequately dealt with at the first stage—and nearly all of them have been—are disturbed as little as possible. Any minor revision, such as removal of a tag of tissue, is done after the blood clot has been gently removed. The edges of the wound are separated from the underlying structures by blunt dissection and brought into apposition by interrupted sutures. It is important to obtain accurate apposition of the skin edges. In deeper wounds the tract is explored, not only to make sure that no revision is needed but also to prepare the site for the reception of penicillin tubes.

Drainage is rarely employed, except at the angles of the suture line of a major amputation. Buried sutures are avoided as far as possible.

With severe fractures, especially those of the femur, there is a tendency to delay suture to between the sixth and tenth days, and in one orthopedic center a large posterior drain is frequently used. This, however, is one of the many variations used among surgeons. A certain amount of tension is permitted, but when skin loss is considerable, the edges are brought as close as seems wise and the operation is completed after five days, by which time it is often possible to secure close apposition. When skin loss is great—because of primary destruction by the missile, for forward surgeons are very conservative with skin—a simple flap may be used, or epithelial cover may be provided by immediate patch skin grafts. After operation the limb is put at rest, and as a rule it is not disturbed for ten or twelve days, after which the stitches are removed in the operating theater. With deeper wounds, however, or if there is tension after suture, it is increasingly the custom to make an interim inspection in the operating theater after five days. No dressings or inspections are permitted in the wards. Amputations both above and below the knee are particularly suited for the technique of delayed suture. Provided no suture or packing is used at the first stage, the second stage is very simple. The best time for it appears to be about the fourth day, but the flaps remain mobile enough for easy approximation up to the seventh day. A drain is used, which is removed in the operating theater on the second or third day. In every one of a recent series of 14 consecutive cases, from 90 to 100 per cent healing was obtained in fourteen days (Lieutenant Colonel J. McDougall). Wounds involving the hand are also well suited to the delayed suture technique. When amputation of the fingers is necessary, forward surgeons preserve all of the viable skin, "coring" out the bone if need be, so that a good flap is ready and waiting to be used by the surgeon at the base. In the management of large wounds—especially amputations—stress is laid on the importance of the blood picture as represented by the erythrocyte count, the hemoglobin, the hematocrit index, and the plasma protein (all hospitals are equipped with facilities for Van Slyke's plasma-protein estimation), and any deficiencies are treated by blood transfusion before the second stage of the procedure is attempted.

The main local contraindications are:

1. Acute inflammation in the wound, or of the tissues around it, whether pus be present or not. A "dirty" wound is not necessarily un-

suited, for many such wounds show no signs of inflammation, and pyogenic organisms are not more commonly found in them than in wounds which look clean.

2. The presence of gas in the tissues
3. An excessive loss of skin

A delayed suture which is less than 50 per cent successful is regarded as a failure. The common causes of failure are excess of tension at the suture line, and sepsis—or both. The proportion of failures will vary considerably according to the craftsmanship and judgment of the surgeons. If failure is complete, a second attempt may be made after preliminary local treatment, usually with penicillin. In partial failures the unhealed area may be covered with patch grafts. In other cases, again, it may be best to wait a week or more and perform a "secondary suture." This term is used to describe the operation required when the time during which delayed primary suture is still possible (usually less than ten days) has elapsed. It is indicated at any time from fourteen to sixteen days later. The granulation tissue is removed and the skin edges are excised. In effect, the old unhealed wound is replaced by a new one which is immediately closed. Often a flap is needed, and if the wound is large and requires more than the average skill of the general surgeon, the case is transferred to one of the two maxillofacial centers in the Command. Occasionally, failure is due to the retention of unsuspected metal fragments, and, of course, sometimes to sequestra; but no wound is allowed to remain unhealed without good cause.

At least from 17,000 to 18,000 wounds among British and Indian officers and men were closed by delayed primary suture or secondary suture between May 12 and the end of 1944. The data shown in table 1 are derived from an analysis of 3,845 proformas designed for the investigation. A rough division in to three standards of healing has been made.

Grade 1 with from 100 to 90 per cent healing comprised wounds healed by first intention, or wounds which were dry fourteen days after suture, but in which a small part of the wound or a stitch hole or a penicillin-tube hole was healing under a scab. Care was taken to include none but proved cases under this heading.

Grade II with from 89 to 50 per cent healing comprised wounds which healed for the greater part, but in which there was some gaping or a discharge (perhaps through stitch holes) of serum or pus. Most of these healed spontaneously within a short time, or needed help from a patch skin graft

Grade III cases with healing under 50 per cent were regarded as failures. Most of them were, however, only relative failures: few broke down completely.

It will be seen that of the cases treated by delayed suture, 10 per cent were fractures, whereas of the cases treated by secondary suture 20 per cent were fractures. This is because a higher proportion of fractures cases are unsuited for delayed suture and because there is a slightly higher proportion of failure of delayed suture in compound fractures, secondary suture being frequently attempted when delayed suture has failed. A successful delayed suture looks its best a few days after the stitches are removed. As the weeks pass, the scars, particularly of the larger wounds, e.g., in triradiate scars of the buttock, often develop a good deal of keloid formation and become red and unsightly. Often the epithelium gives way, especially at the junction of scars, or over the fibrous track resulting from the passage of the missile. Such scars are very troublesome; they may almost indefinitely delay a patient's return to his unit in category A. Some of these are now being subjected to further excision of the scar tissue, with immediate repair. The relation between the anatomical situation and healing was investigated by an analysis of 1,000 consecutive cases: it was noted that wounds of the buttock were the most intractable.

TABLE 1.—PERCENTAGE OF HEALING IN APPROXIMATELY 18,000 WOUNDS

	Delayed Primary Suture				Secondary Suture			
	Total	Grade I (100-90%)	Grade II (89-50%)	Grade III failures (under 50%)	Total	Grade I (100-90%)	Grade II (89-50%)	Grade III failures (under 50%)
All wounds	3,435	2,693 (78%)	537 (16%)	205 (6%)	410	276 (67%)	96 (24%)	38 (9%)
Compound fractures	429	311 (73%)	79 (18%)	39 (9%)	69	44 (64%)	20 (29%)	5 (7%)
Flesh wounds	3,006	2,382 (79%)	458 (15%)	166 (6%)	341	232 (68%)	76 (22%)	33 (10%)

Under ideal conditions, these results could be very greatly improved, but ideal conditions never occur in war. If they did, there would be no problem in the treatment of war wounds, and primary suture could be used: a two-stage operation would rarely be needed. It is, in fact, against the conditions created by war that we are constantly battling in surgery, and to achieve success with delayed suture the rules enunciated here should have strict compliance. One fact that shows up plainly is that the risk of closing fractures has been exaggerated in the past. Provided the rules are obeyed, fracture wounds may be closed as fearlessly as flesh wounds. And they should be closed as fearlessly, for the need is greater: sepsis established in a bone usually comes to stay.

The standard treatment of wounds of both flesh and bone (face and head excepted) in the Italian theatre of war is a two-stage operation. Certain rules must be obeyed if a high measure of success is to be achieved and disasters are to be avoided. The results of the two-stage operation in 3,435 wounds so treated during September and October were recorded, together with the results in 410 wounds treated by late closure (secondary suture).

CHARLES BARON, M.D.

Brown, J. J. M.: Wounds of the Soft Tissue; Two-Stage Treatment. *Lancet*, Lond., 1945, 248: 588.

Penicillin as a local bacteriostatic has so revolutionized the delayed closure of soft-tissue wounds that the two-stage method has become firmly established as the best form of therapy. Of 721 wounds sutured with the use of penicillin powder or penicillin instillation, only 62 (8.6 per cent) have been considered failures. Success depends first and foremost on adequate primary surgery. No bacteriostatic, however effective, must be allowed to replace thorough wound excision. The results of the two-stage treatment are a tribute to the work of the surgeons in the forward areas. CHARLES BARON, M.D.

Converse, J. M.: Early and Late Treatment of Gunshot Wounds of the Jaws in French Battle Casualties in North Africa and Italy. *J. Oral Surg.*, 1945, 3: 112.

The treatment of gunshot wounds of the jaws may be divided into three distinct periods: the first, or early phase of blood loss, shock, pain, asphyxia, and mental depression; the second, or prereconstructive phase when immobilization of the bone fragments and control of infection are of primary importance; and the third, or reconstructive phase proper.

In the first or early phase the control of hemorrhage, the relief of respiratory obstruction, and the treatment of shock by transfusions are essential and life-saving measures. Primary suture of the wounds is not advised; débridement, although sparing, should aim at the removal of devitalized tissue, loose bone fragments, and foreign bodies. Immobilization of the remaining fragments should be done by simple means, such as ligature wires or elastics.

At the second stage definitive means of immobilizing the bone fragments (splints, arches, and bands) are used. Wound infection is controlled by irrigations, pressure dressings, and bacteriostatics. When the wound is clean, pink, and devoid of edema, late primary suture should be done. Other problems which may require attention at this time include:

1. The extraction of teeth in the line of fracture. This should be done whenever a tooth is deprived of its blood supply and before necrosis of the pulp leads to suppuration.

2. External drainage. This is indicated only for the evacuation of collected pus or of a large hematoma.

3. Late primary suture of wounds over comminuted fractures. This may prevent sequestration of these denuded fragments.

4. External fixation of the bone fragments. This is occasionally indicated to immobilize edentulous bone fragments.

5. The use of interosseus wiring. This is a helpful technique for immobilizing fractures of the mandibular angle when there is marked displacement of the posterior edentulous fragment.

In the third, or reconstructive, phase proper early treatment may greatly simplify the reconstructive surgical procedures to restore soft tissues and bone.

The reconstruction of soft tissues must be accomplished first. Partial defects of the lower lips can be restored with local flaps, while larger defects will require the bringing in of tissue from a distance by means of pedicled flaps.

The reconstruction of bone by means of bone grafts requires the presence of well vascularized, nonscarred, soft tissue. All signs of sepsis must be absent and complete immobilization after grafting must be assured. Bone grafts may be taken from the internal aspect of the ilium and may be used in the form of chips or small fragments which are packed solidly into the defect, or as a carved block which is usually wired in place. Occasionally a bone strut surrounded by bone chips is used. The average time for the consolidation of bone grafts is about two months.

The final step in reconstruction consists in restoring the buccal sulcus to form an alveolar ridge which will permit the wearing of a prosthesis. An inlay graft wrapped around a mold and held in place with a splint is used. The splint is usually attached to the teeth, but in edentulous cases it may be anchored with stainless steel wire passed through all layers and tied over gauze.

The author's presentation is based upon a series of 168 maxillofacial cases, and the original article contains 34 photographs and diagrams of good quality and clarity. JOSEPH J. MCDONALD, M.D.

Aylett, S. O., and Alsop, A. F.: Surgery and Anesthesia of Abdominal War Wounds. *Brit. M. J.*, 1945, 1: 547.

This article reports the treatment and anesthesia of a series of missile wounds of the abdomen seen in the forward areas during the present campaign in Europe. Approximately one-fourth of the work of the forward surgeon is likely to be concerned with this type of injury. With the exception of 1 case, all those which were operated on were given pentothal anesthesia alone. Stress is made on the great need of a high-grade anesthetist to accompany forward surgeons. The diagnosis and treatment of gunshot wounds of the abdomen are discussed.

The amount of transfusion required to render a patient fit for operation must vary according to the severity of the local as well as the associated injury. It is the aim to improve the blood pressure to a minimum of 60 mm. diastolic and 100 mm. systolic.

Pentothal sodium was chosen as the sole anesthetic, not because it was believed in the beginning to be the best, but because it was the only drug available under field conditions. Ether was considered harmful to tissues suffering from anoxemia due to hemorrhage and shock; spinal analgesia was considered dangerous in severely shocked cases; splanchic analgesia was time-consuming. A 5 per cent solution of pentothal was used and unless crystallization had occurred, three-day-old solutions were found as efficacious as those recently prepared. An estimation of the condition of the patient was based chiefly on the diastolic blood pressure. When it was below 70 mm. of mer-

cury a moderate degree of shock was considered present. In such patients an induction dose of from 0.1 to 0.25 gm. of pentothal was adequate.

Respiratory depression occurred in those patients with spinal shock who received more than 0.2 gm. for an induction dose.

Hiccups occurred in cases that required large doses of pentothal.

When postoperative sedation was needed morphine was administered intravenously in 1/6 gr. doses as it was found that with established shock of any severity there was very slow absorption from any other route.

Postoperative complications were few and included 1 case of vomiting, 1 case of pulmonary atelectasis, and 3 cases of pneumonia. Of 21 deaths in the series of 200 consecutive battle casualties in which the abdomen was explored in 56 cases, only 6 could be attributed to the anesthesia.

With this form of anesthesia no great improvement in the ultimate recovery rate of perforating wounds of the abdomen could be claimed, but at least the mortality was no greater than with other forms.

The operative procedure and postoperative course were discussed in detail. It is the opinion of the authors that pentothal has been found to be an ideal anesthetic for abdominal surgery in shocked patients. While this drug can be used with safety when there is only a mild degree of shock and when large doses have to be given, it is difficult to control and cannot be recommended in these cases.

MARY KARP, M.D.

Cooke, W. T., Peeney, A. L. P., Thomas, G., Elkes, J. J., and Others: Clostridial Infections in War Wounds. *Lancet*, Lond., 1945, 248: 487.

Clostridial infection of wounds in human subjects is essentially a wartime problem. The local spread of the infectious process can be adequately studied only if facilities are available for controlled experimental work on clostridial infections, but the nature and etiology of the systemic reactions can be investigated by examination of the effects of potent toxins and correlation with clinical observations.

From a series of 2,680 wounded men from the Western Front a group of 76 cases with systemic reactions have been studied. All but 4 of this group showed evidence of clostridial organisms in their wounds. The group has been subdivided on the basis of the severity of the systemic reaction into four sections of increasing severity, the last consisting of 2 fatal cases. The 2 fatal cases, 7 of the severe, and 18 of the moderate group gave a histopathological picture of clostridial myositis.

Possible significant features in the biochemical findings were low blood cholesterol and high urine creatine levels. Acidosis did not appear to be greater in this group than in other wounded men. While the hematological studies showed evidence of a hemolytic process in some cases, severe hemolysis was not a feature in any case. Flocculation of chylomicrons occurred in a number of cases, but this is not specific for clostridial infection, nor can it be attributed to the direct action of clostridial toxins.

At autopsy in the fatal cases, extensive fat embolism of the lungs and other organs was demonstrated and demyelination was found in the central nervous system.

It is clear that the systemic reaction in the reported series of 76 cases cannot be attributed to the effects of clostridial toxins. These were, however, almost certainly a major factor in the 2 fatal cases and it seems possible that they played some part in the systemic reactions in the 7 severe cases and 18 moderate cases in which the histopathological picture was one of clostridial myositis. In the remaining cases it seems likely that the part played by the clostridia in the production of the systemic reaction was negligible. The balance of evidence suggests that the products of tissue breakdown may be a more important factor in the systemic reaction than circulating toxin.

Such a conception of the nature of the systemic reaction in clostridial infections would lend support to the view that adequate surgical removal of necrotic muscle from the wound is the most vital measure in treatment of the systemic reaction. The lack of dramatic effect with antitoxin would be expected if breakdown products are largely responsible for the systemic reaction, but antitoxin given early and in large doses might have some protective effect, since it prevents the breakdown of tissues by clostridial toxins in vitro. It is clearly impossible to attempt any assessment of the value of chemotherapy in these conditions from this small group of cases, but it seems probable that its efficacy will be limited in the absence of adequate surgery.

JOSEPH K. NARAT, M.D.

Boland, F. K., Claiborne, T. S., and Parker, F. P.: Trench Foot. *Surgery*, 1945, 17: 564.

The authors present an analysis of their observations on 125 cases of trench foot submitted to their care during the Italian campaign. Among these cases were 2 of immersion foot, the clinical course of which could not be distinguished from that of trench foot.

The predisposing factors are those of continuous exposure to wet and cold, usually with a dependent position of the feet and circulatory stasis. Wet socks and previous attacks of frostbite were also considered to be etiological factors.

Painful and swollen feet were usually the earliest symptoms, the swelling often appearing before the pain. Numbness and burning were other symptoms, and sweating and coldness appeared late. In 25 per cent of all the patients the pulsation in the dorsal pedal and the posterior tibial arteries was absent.

Skin biopsies taken from patients without gangrene but with persistent symptoms revealed an increased formation of collagen. This was most marked in the papillary layer of the dermis and in the surrounding small blood vessels.

From observation of this group of patients, it appears that this is a condition caused primarily by ischemia due to capillary constriction resulting from long exposure to cold. This reaction is intensified by wet, stasis, and pressure. The continued ischemia produces varying degrees of capillary damage which is manifested by edema and increased heat upon the resumption of active circulation. In certain cases in which edema persists, chronic inflammation with diffuse terminal fibrosis is found, and in more severe cases nonprogressive dry gangrene develops.

Simple conservative treatment and inducing the patient to walk at the earliest possible time seem to give the best results. Amputation of the gangrenous parts was not necessary in any of these cases. Prevention is probably not possible in all cases, but education of the individual soldier in foot care, and the provision of loose, dry footgear should minimize the occurrence of this condition.

BENJAMIN GOLDMAN, M.D.

Bentley, F. H., and Thomson, S.: Control of Infection in Recent Wounds. *Brit. M. J.*, 1945, 1: 471.

In an investigation of 1,000 battle wounds, the organism of initial sepsis was found to be the staphylococcus pyogenes aureus. The streptococcus pyogenes (hemolytic streptococcus) was rarely found.

The incidence of infection in wounds before operation at the casualty clearing station was about 51 per cent.

Of the wounds which had not been disturbed during transit and which were treated at the casualty clearing station by operation alone, 49 per cent were infected and 23 per cent were septic; of those treated by operation and sulfanilamide powder, 43 per cent were infected and 11 per cent were septic; of those treated by operation and penicillin-sulfathiazole powder, 25 per cent were infected and 7 per cent were septic, when examined at the base hospital five to ten days later. Thus, operation alone did not completely remove the infection from a recent wound; however, it left the wound in the best possible condition for dealing with the infection that remained. Sulfanilamide, applied locally, produced a bacteriostatic effect, for, although the infecting bacteria persisted, their activity was depressed and as a consequence the incidence of sepsis was reduced. Penicillin-sulfathiazole powder, similarly applied, was more effective; its use was followed by the destruction of the infecting cocci in about one-half the infected wounds, and by an equally low incidence of sepsis.

The incidence of infection in wounds operated upon at the casualty clearing station in less than twelve hours after their occurrence was lower than that in wounds which were operated upon after a period of from twelve to twenty-four hours. This would apply to all groups in which chemotherapy was used. The period which elapsed from the time of wounding until arrival of the case at the base hospital had no significant bearing on the rate of infection. The incidence of infection was higher in wounds that had been redressed during transit from the casualty clearing station to the base hospital than in wounds that had not been disturbed.

The importance of the control of infection by operation and chemotherapy at the casualty clearing station is illustrated by the results of suture. The presence of pyogenic organisms in the wound at the time that suture was performed had an adverse influence on the result obtained. Of those wounds which were uninfected with these organisms, from 80 to 85 per cent healed by primary union, whether they appeared to be clean or dirty. Wounds infected by pyogenic organisms, even though they appeared to be clean, showed a lower rate of success in healing.

The presence in wounds of staphylococci possessing some measure of resistance to penicillin did not influence the results of suture when penicillin was employed locally in the wound. SAMUEL KAHN, M.D.

Innes, A., and Ellis, V. H.: Battle Casualties Treated with Penicillin. *Lancet*, Lond., 1945, 248: 524.

The clinical experiences gained in the treatment with penicillin of over 1,500 severely wounded men (selected from 15,561 invasion casualties) are surveyed.

Several misleading symptoms and signs were noted in successful cases.

Some patients looked very ill, although they were comfortable and seemed and felt well; others ran a protracted fever without local sepsis or general malaise or signs of sepsis, and these were thought to be having reactions to penicillin.

Protracted fever which continued after penicillin had been stopped was most commonly the result of "cold" abscesses around foreign bodies.

The clinical assessment of cases under penicillin therapy is difficult, and the drug has a masking effect on severe cases in transit. Great care is required in the examination of such cases.

Penicillin does not lessen the need for adequate forward surgery, but merely delays the onset of symptoms.

The delayed suture of wounds with the use of penicillin-sulfonamide powder is described; particular reference is made to the treatment of compound fractures.

A boost dose of 50,000 units of penicillin is a useful preliminary measure to manipulation of infected wounds or fractures. JOHN E. KIRKPATRICK, M.D.

Dolton, E. G., Gardner, E., and Wylie, W. D.: Fatal Air Embolism During Blood Transfusions. *Lancet*, Lond., 1945, 248: 531.

The authors report a case of fatal air embolism during blood transfusion. The operation for carcinoma of the fundus of the stomach and lower esophagus had been in progress for two and one-quarter hours and the patient's condition was excellent. The blood transfusion entering by way of the left saphenous vein at the ankle had slowed up considerably and was accelerated by means of a Higginson syringe to increase the air pressure above the par-

tially blocked filter, a routine practice. About fifteen minutes later the patient rapidly became cyanosed and died.

Autopsy revealed that death resulted from air embolism due to intermittent columns of air which entered the drip chamber. It is pointed out that forcing transfusions by air pressure is a dangerous procedure. JOHN E. KIRKPATRICK, M.D.

OPERATIVE SURGERY AND TECHNIQUE; POSTOPERATIVE TREATMENT

Clark, A. M., Milne, G. R., and Todd, J. P.: Fixation of Skin-Grafts with Human Plasma and Thrombin. *Lancet*, Lond., 1945, 248: 498.

A method of fixation of skin grafts with human plasma and thrombin is described; it is similar in principle to that published by Sano in 1943 but differs with regard to the source of the materials used. Instead of using plasma prepared from the patient's own blood, the plasma is obtained from blood of a group AB donor, and in place of the cell extract of Sano, a thrombin solution is prepared by the method of Herbert. The thrombin may be stored frozen in a refrigerator until needed.

The recipient area is prepared by applying the plasma with a sterile camel-hair brush. Bleeding, which may be troublesome, is quickly controlled when the plasma is applied. The raw surface of the skin graft is then painted with the solution of thrombin and the graft applied to the recipient area. With large grafts it is advantageous to insert a few stitches to anchor them and prevent slipping when pressure is applied.

Over 60 burns have been successfully skin-grafted with this method which saves time by controlling the oozing from raw surfaces and by minimizing the need for the stitching of grafts in position. It eliminates the main disadvantages of Sano's method, namely, the troublesome laboratory procedures needed before operation, and the necessity of withdrawing blood from the patient. The materials used are readily available from the local transfusion services in a form ready for use. JOSEPH J. MCDONALD, M.D.

Young, F.: Homogenous Cartilage Grafts. *Surgery*, 1945, 17: 616.

There is some confusion regarding the viability of various types of cartilage transplants. Two dogs were anesthetized, and segments of costal cartilage removed from one were transplanted at once to the abdominal wall of the other. Five pairs of dogs were used. Six pieces were implanted in the abdominal wall of each animal, three on the right and three on the left. In this experiment soft tissues were removed from the transplant but no attempt was made to strip off the perichondrium, since in previous work it was found that the presence or absence of perichondrium had no effect on the survival of autogenous cartilage grafts. Thus, 60 pieces of costal cartilage were implanted in the abdominal walls of 10 dogs, the cartilage being obtained from a donor dog in each instance. These grafts were then removed from a pair of dogs at intervals. In this way 12 grafts were removed at two weeks, three months, six months, one year, and one and one-half years.

On removal the transplants were firmly attached to the soft tissues without noticeable inflammatory or fibrotic reaction about them. They retained their cartilaginous appearance and springlike physical properties. The grafts were measured and it was found that there was no significant change in size. All of the recovered transplants were sectioned and examined microscopically. The author believes that if the presence of normal cartilaginous architecture is a criterion, then one can state without hesitation that these cross transplants remain viable.

The author concludes that from this experiment it appears that costal cartilage can be transplanted from one dog to the subcutaneous tissues of another dog and remain viable in its new location up to one and one-half years. LOUIS T. BYARS, M.D.

Drummond, R., Taylor, G. L., and Edwards, J. T. R.: Isoimmunization to the Rh Factor. *Brit. M. J.*, 1945, 1: 584.

The authors report a case of isoimmunization to the Rh factor following repeated blood transfusions and resulting in hemolytic reactions of varying degree and in the development of anti-Rh agglutinins of exceptionally high titer in the serum of the recipient.

The patient was an unmarried woman, forty-seven years of age, who had been suffering from melena, hemoptysis, and vaginal bleeding. The hemoglobin was 30 per cent and the red cell count was 1,552,000. A series of 10 transfusions was given without any appreciable therapeutic effect. The recipient was group "O" as were the donors. Blood grouping and blood matching tests were performed prior to the transfusions.

The first 3 transfusions were given on the first, second, and sixth hospital day, and 5 of the 6 donors used were Rh-positive; the Rh group of the sixth donor was not known. The patient was diagnosed as Rh-positive on the third day of hospitalization after the third transfusion, which in retrospect was certainly due to large numbers of surviving cells of the Rh donors in the recipient's blood. The reaction complicating the third transfusion was possibly hemolytic in nature because there was no rise of hemoglobin. Hemolytic reactions complicated the seventh, eighth, ninth, and tenth transfusions. It was because of the reaction and the agglutinins observed in the crossmatching test after the tenth transfusion and the failure of the patient to improve after sixty-six days of hospitalization that the necessity of further investigation was apparent and it was disclosed that the recipient's blood originally was Rh-negative. Potent anti-Rh agglutinins, moreover, were discovered in the recipient's serum.

After these findings were discovered 14 subsequent transfusions were given involving the blood of 27 Rh-negative donors. Improvement followed after

these transfusions and there were no febrile reactions; the hemoglobin was raised from 29 to 70 per cent. The patient rallied temporarily but ultimately her condition deteriorated and she died on the one hundred and twenty-eighth hospital day.

The importance of preserving pretransfusion blood samples of donors and recipients is brought out in this case, as is also the necessity of ascertaining the Rh group of a recipient as a preliminary measure when multiple blood transfusions are contemplated. Rh grouping after transfusion may be misleading, and reliable crossmatching tests before each transfusion, however numerous, should be performed.

STEPHEN A. ZIEMAN, M.D.

Massie, F. M.: Heparin in the Abdomen. *Ann. Surg.*, 1945, 121: 508.

Heparin given intra-abdominally to prevent obstructing adhesions should be limited to those patients who have had one or more operations for obstruction or repeated attacks following abdominal surgery.

The hazards are hemorrhage, infection, and possibly delay in wound healing. The contraindications are recent abdominal surgery, incomplete hemostasis, and possibly intestinal resection. The hazards should be recognized promptly when they appear; they can be checked by blood transfusion. Red-cell and hemoglobin determinations, blood-pressure readings, and the general appearance of the patient are better guides in postheparin treatment than any known tests of the coagulation time. Accidental opening of the bowel during the dissection of adhesions is not a contraindication for heparin administration.

In a small series of cases the author was pleased with the complete absence of obstruction in the months and years following the use of heparin in the abdomen, but until there are more clinical reports we must consider the use of heparin to prevent "obstructing" adhesions as promising but not yet completely settled.

CHARLES BARON, M.D.

Frantz, V. K.: New Methods of Hemostasis. *Surg. Clin. N. America*, 1945, 25: 338.

The author reviews the basic principles of sound surgical procedure, and in connection with the second of these, the meticulous control of bleeding, considers the technique of hemostasis in the light of new developments. Soluble thrombin, fibrin foam, absorbable gauze, cotton, and absorbable sponge are discussed in detail as agents to promote hemostasis. Further laboratory and clinical investigations of the substances are in progress with a view to determining their fields of greatest usefulness.

JOHN J. MALONEY, M.D.

D'Ingianni, V.: Early and Late Postoperative Ambulation; A Comparative Study of 303 Cases. *Arch. Surg.*, 1945, 50: 214.

In a study of 303 patients, the author presents several distinct advantages of early ambulation as a method of postoperative treatment. Seven cases are reported in detail. Of the 303 patients 150 received conservative treatment while 153 became ambulatory immediately after operation.

The healing of wounds is closely associated with early ambulation. It has been shown that dogs and rats which are allowed to be active soon after operation show an observable and a recordable difference in the tensile strength of the operative wound, as compared with animals which are permitted progressive increase in exercise from day to day.

The usual method of treatment has been to allow the patient to rise and move about during the particular phase of healing when a wound that has been closed with surgical gut is weakest. Pulmonary emboli may occur between the third and the thirteenth postoperative days. This period coincides with the usual time of ambulation and sudden death which occurs when the patient sits up for the first time is caused by the breaking-off of the thrombus, which was formed about seven days before.

Nanta pointed out that the effect of gravity is an important factor to be overcome in pneumonitis, for it tends to produce stasis, followed by edema of the tissues, which, in turn, encourages the growth of organisms. The circulation time is increased from one and five-tenths to four and five-tenths seconds by a change from the sitting to the standing position. Constant massage of the vascular system by the contracting muscles accelerates the flow of blood. Each muscle is a "heart" and acts like a substation in sending on the flow of blood. In view that anesthesia predisposes to infection of the respiratory tract and phlebitis, one does well to avoid the additional complication of stasis. The metabolism is greatly slowed down by inactivity. The standing position relieves subdiaphragmatic pressure and thus permits greater expansion of the lungs.

With a special diet, rest in bed, catheterization, and purgation, a mental attitude of well being is maintained and there is no longer a period of abnormal body function.

The two most frequently mentioned contraindications to early ambulation are (1) pulmonary emboli, and (2) the danger resulting from closure of the wound with absorbable material. The author notes that among the 20,000 cases in which the patient became ambulatory early, there have been reported to date but 5 cases (0.025 per cent) of pulmonary embolism. Since in many of the 20,000 cases surgical gut was used for closure with no reported ill effects, there seems little to be feared with this type of suture material.

Early ambulation made possible a saving of at least $1,464.00 in hospital expenses to the patients in the present series. If the compound earnings yielded by an early return to work are added to this figure, the sum total should be startling. A shortened period of hospitalization also permitted a quick turnover of patients.

In the series of cases presented, the patients were divided into 3 groups: (1) patients having an ap-

pendectomy only; (2) patients having a surgical operation on the lower portion of the abdomen, with or without appendectomy, or with or without vaginal repair; and (3) patients having a cholecystectomy. The age distributions in the 3 groups and number of patients in each age decade were similar.

In conclusion the author notes that early ambulation does not increase the frequency of complications nor endanger the patient, as has been proved by case reports and experience. However, neither does early ambulation eliminate all of the complications, as has been claimed by many advocates of this method of postoperative treatment.

HERBERT F. THURSTON, M.D.

Davis, H. H., and Hansen, T. M.: Investigation of the Cause and Prevention of Gas Pains following Abdominal Operation. *Surgery*, 1945, 17: 492.

Postoperatively after abdominal surgery there is a definite decrease in intestinal motility. Drugs such as opiates, physostigmine, and prostigmine, which stimulate the small intestine, have an opposite effect on the colon. Pitressin inhibits small-bowel activity but stimulates the colon. The accumulated gas in the intestine is caused by the swallowing of air, especially during the induction phase of anesthesia, rather than any putrefactive process. The authors measured the amount of swallowed air during the induction phase of anesthesia and found it to vary from 600 to 2,150 c.c.

Swallowed air and the attendant discomforts of gas pains can be prevented by the preoperative introduction of a Levin tube attached to Wangensteen suction. Once the air passes into the small bowel the latter method is no longer effective.

As a result of the preoperative suction technique the percentage of patients with gas has dropped from 81 to 41 per cent, and the average number of days with gas pains dropped from 2.4 to 1.95 per cent. Further, the necessity for the use of prostigmine was markedly reduced, also that of enemas and rectal tubes. BENJAMIN G. P. SHAFIROFF, M.D.

Phemister, D. B.: The Mechanism and Management of Surgical Shock. *J. Am. M. Ass.*, 1945, 127: 1109.

Surgical shock is the term commonly used to denote the acute embarrassment or failure of the circulation which arises as a result of bodily injury, whether produced intentionally, in combat and in surgical operations, or unintentionally, in accidents of civil life.

There has been a great deal of debate about the mechanism of production of shock and about the relative role of various factors which may help in bringing it about, but in recent years it has been established primarily by surgeons that the overwhelmingly important cause of surgical shock in a man in good general condition prior to injury or operation is the local loss of whole blood or plasma, or of both, from the circulation, which reduces the circulatory blood volume. If this reduction is sufficiently pronounced and prolonged, the blood pressure drops to a low level, anoxia develops, the tissues are damaged, and body function is impaired on the whole, and a continuation of such a state results in complete failure of the circulation and death.

The loss of whole blood is by far of the greatest importance, since it is the main cause of shock in operations and in most injuries which open the blood vessels. The loss may be to the outside, into the body cavities, or into the tissues. Plasma may be lost both to the outside and into the tissues in burns, into the tissues only after the prolonged use of the tourniquet, and into the peritoneal cavity, as in case of strangulation of a loop of intestine by an adhesive band or in case of mesenteric thrombosis. Blood and plasma in varied proportions may be lost into traumatized tissue, as in limbs hammered for the production of experimental shock or limbs crushed and compressed by falling objects in air-raid casualties or in accidents of civil life.

There is a mounting tide of clinical evidence that the overwhelmingly important cause of shock produced by operation and by injury is the local loss of fluid from the circulation, and that toxins formed in the damaged tissues and the activity of the nervous system are factors of only minor importance.

The irrefutable evidence in support of this view is furnished by the almost complete control or elimination of shock as a complication of operations and injuries when prompt care is rendered in hospitals in which the operative technique is excellent, and blood and plasma transfusions are given in amounts equivalent to, and either simultaneously with or soon after, the blood and plasma loss.

A full appreciation of these facts will lessen the fear, of nervous and toxic factors, and lead to a great increase in the frequency of transfusions given in amounts equivalent to the blood and plasma loss, with corresponding improvement in the results of surgical therapy. JOHN E. KIRKPATRICK, M.D.

McLachlin, J. A.: The Intravenous Use of Novocain as a Substitute for Morphine in Postoperative Care. *Canad. M. Ass. J.*, 1945, 52: 383.

Novocain has been administered intravenously in the treatment of tinnitus aurium, and for the pruritus of jaundice. Recently, procaine has been given intravenously for the surgical treatment of burns. It has been shown that procaine is detoxified and hydrolyzed down to para-aminobenzoic acid and diethylamino-ethanol, which are excreted by the kidneys within ten or twelve hours.

Pharmacologically, procaine has a marked affinity for nerve tissue and acts as a convulsant and stimulant of the cerebrum. Systemic reaction to procaine is rare and can be predicted by means of an intradermal wheal of procaine. Toxic reactions during the intravenous administration of the drug may be either of the convulsant type in the central nervous system, which can be controlled by sodium luminal, or of the respiratory-circulatory type, controlled by adrenalin.

In the author's series of 10 postoperative cases, novocain was given intravenously as a substitute for morphine. By the use of this drug, vomiting and malaise from morphine were eliminated and the period of relief from pain greatly exceeded that obtained with the latter drug. The amount of novocain given was 1 gm. in 500 c.c. of normal saline solution. There were no toxic reactions.

B. G. P. SHAFIROFF, M.D.

ANTISEPTIC SURGERY; TREATMENT OF WOUNDS AND INFECTIONS

Peterson, L. W.: Prophylaxis of Wound Infection; Studies with Particular Reference to Soaps and Irrigation. *Arch. Surg.*, 1945, 50: 177.

Because the germicidal property of soap is unquestioned, and the irritative quality of soap in wounds is neither great nor particularly damaging, a series of experiments on animals was conducted to ascertain the superiority of cleansing with soap and water over other methods of cleansing wounds. Both clean and contaminated wounds were studied in a series of 76 dogs. All wounds were made on the carefully shaved backs of the animals after preparation of the skin by washing with soap and water and then painting it with iodine and removing the iodine with alcohol. Pentobarbital sodium was administered as the anesthetic.

The following points were studied:

1. The effect of soap on the healing of noncontaminated wounds
2. The effect of scrubbing on the healing of noncontaminated wounds
3. The effect of soap and scrubbing on the healing of contaminated wounds
4. The effect of irrigation with various quantities of isotonic solution of sodium chloride on the healing of contaminated wounds

Results of the experiments indicated that when the soaps were placed in actual contact with the uncontaminated fresh wounds, they produced a definite but slight irritation. This was noted only on microscopic examination; gross examination revealed no difference between control wounds and wounds into which soap had been placed. However, in wounds which were contaminated by a given amount of culture of the staphylococcus aureus which was placed within their depths, and then were exposed to soap, there was a definite increase in the signs of infection over those found in the control wounds not exposed to soap; "green" soap was found more irritating than "white" soap.

The harmful effect of mechanical washing of the wounds is in direct proportion to the coarseness of the material used.

It was concluded that of the various methods studied, the cleansing of contaminated wounds by gentle irrigation with an isotonic solution of sodium chloride is the most effective prophylaxis of wound infection. Contaminated wounds treated by this gentle irrigation healed with less evidence of infection than did control contaminated wounds subjected to no treatment other than closure done at the specified time.

The best results in cleansing these wounds were obtained by irrigating them with 1,000 c.c. of saline solution with no scrubbing, and utilizing the force of the stream as the washing mechanism.

STEPHEN A. ZIEMAN, M.D.

Heggie, J. F., Warnock, G. B. R., and Nevin, R. W.: "Neutral Proflavine Sulfate" in Infected Wounds Involving Bone. *Brit. M. J.*, 1945, 1: 437.

Sterile neutral proflavine sulfate powder was applied to gunshot and similar wounds with compound fractures which had been infected and had remained relatively untreated for from six months to two years. Various therapeutic measures had been tried throughout this period, including many sequestrectomies. Application of the neutral proflavine sulfate powder was preceded by "refresher" surgery to the wounded area, at which time the wound was débrided, the bone curetted and guttered, the sequestra removed, and the sinuses treated by curettement and removal of any retained material found at their base.

When applied as pure powder, in small doses of from 0.2 to 0.5 gm., which are repeated at intervals of from five to fifteen days, infection is reduced, discharges are diminished and soon cease as the wound becomes dry, and healing proceeds. In such cases the proflavine sulfates produce little or no tissue necrosis, because of the "sparing" action of the exudates, in which, after probably some measure of protein precipitation, they dissolve and diffuse to the tissues in effective bactericidal and bacteriostatic concentration.

When applied, however, to freshly "débrided" wounds, or wounds with little exudate, a chemical inflammation occurs, attended by superficial coagulation necrosis to a depth of from 2 to 4 mm.; this is due to solution of the sulfates in the tissue fluid to a protein-precipitating concentration. Healing, at first arrested, is generally retarded and occurs under or after separation of the eschar. In saline solution the lowest concentration of these salts at which protein precipitation occurs is 0.6 per cent and 0.25 per cent of neutral proflavine sulfate mono-acid and proflavine sulfate B.P., respectively.

Regarding the prophylactic use of the proflavine sulfates, it is suggested that for local application in powder form they be diluted with sulfathiazole to 0.5 per cent in the case of neutral proflavine sulfate, and 0.2 per cent for proflavine sulfate B.P. These are the highest concentrations to be employed if coagulation necrosis is to be avoided and tissue damage kept to a minimum.

In order to obviate the difficulty of effectively applying powders to irregular wound cavities, a simple pouring tragacanth gel containing a 0.5 per cent saline solution of the drug was used for prophylactic treatment of the wounds.

STEPHEN A. ZIEMAN, M.D.

Spink, W. W., and Hall, W. H.: Penicillin Therapy at the University of Minnesota Hospitals from 1942 to 1944. *Ann. Int. M.*, 1945, 22: 510.

The results in 200 patients treated with penicillin in a two-year period are presented. Penicillin is considered the most effective agent available for the treatment of staphylococcal and some types of hemolytic streptococcal infections. In pneumococcal and staphylococcal meningitis, reduction of the mortality rate by the use of this drug may be anticipated; in meningococcal meningitis, which usually also responds readily to the sulfonamides, penicillin is also effective. In lung infections due to pyogenic, gram-positive cocci, and to pneumococci, results were encouraging, but there is evidence that some green-producing strains of streptococci and nonhemolytic streptococci are highly resistant to the drug. Suppurative empyema and pericarditis may often be controlled with penicillin without need of surgical drainage of the cavities. In gonorrhea, with or without complications such as arthritis, penicillin is the drug of choice.

The incidence of toxic manifestations in this series of cases was very low; 2 patients developed an unexplained rise in temperature; and 1 had urticaria after one week of penicillin treatment, but resumption of treatment after twenty-four hours was without incident.

The desirability of obtaining precise bacteriological data before instituting treatment is stressed. various problems remain to be solved, such as the optimal doses to be used in a specific infection, and whether penicillin given concurrently with the sulfonamides may yield better results in the treatment of certain types of infection.

WALTER H. NADLER, M.D.

ANESTHESIA

Roman-Vega, D. A., and Adriani, J.: Prolonged Spinal Anesthesia. *Surgery*, 1945, 17: 524.

The authors describe a simplified technique for prolonged spinal anesthesia with nupercaine. The technique is rapidly executed and reasonably controllable. The results are little influenced by wide variations in such intrinsic factors as the length and diameter of the cord, the size of the subarachnoid space, or the body weight. The extrinsic factors influencing the extent and intensity of spinal anesthesia are the volume of the solution injected, the specific gravity of the solution, the rate of injection, the dose of drug, the site of injection, and the position of the patient after injection of the drug. In this technique all extrinsic factors are fixed with the exception of the position of the patient.

The preparation employed for this technique consists of the administration of ½ per cent nupercaine hydrochloride dissolved in a phosphate buffer and saline solution. Each cubic centimeter contains 5 mgm. of the drug. The volume of solution containing the estimated dose of the drug is mixed with an equal volume of 10 per cent glucose in saline solution or water. The resulting volume of solution, even when the maximum dosage is employed, is relatively small. The mixture is injected into the subarachnoid space through a 20- or 22-gauge needle as rapidly as gentle pressure on the plunger permits without barbotage. The lateral prone position is preferred, but the upright sitting posture may be employed if desired. The spinal puncture is performed at the level of the third lumbar interspace for anesthesia above the costal margin and at the level of the fourth lumbar interspace when less extensive anesthesia is required. Immediately following the injection, the patient is placed on his back and the operating table is tilted in a Trendelenburg position. The angle varies with the height of anesthesia desired. The head is flexed as sharply as possible upon the thorax by supporting it upon a doubled pillow so that the mixture may not ascend into the cervical region. Generally, within fifteen or twenty seconds the subject notices a feeling of numbness in the lower extremities.

In contrast to the behavior of the shorter-acting drugs such as procaine, metycaine, monocaine, and others, which seem to act almost immediately, the onset of anesthesia is delayed when nupercaine or pontocaine is employed. However, hypalgesia, which always precedes anesthesia, ensues immediately. Consequently, when performing the sensory examination to establish the level of anesthesia, one does not seek the areas of complete insensibility, but instead, those of hypalgesia or diminished sensation. The line of demarcation between the hypalgesic and unanesthetized area is reasonably sharp and well defined. When this line of demarcation lies in the dermatome in which anesthesia is desired, the ascent of the drug is terminated by promptly readjusting the operating table to the horizontal position. The hypalgesic areas in due time become completely anesthetic and there appears to be little or no tendency for the anesthesia to creep beyond a given level once it is established at that level.

The time the patient remains in the inclined position varies for each individual case as does the degree of inclination of the operating table. For upper abdominal surgery the lower seven thoracic segments must be anesthetized, and to secure this extent of anesthesia the inclination must be steep, approximately 20 degrees. Failure to obtain satisfactory anesthesia for upper-abdominal surgery is frequently due to delay in inclining the table promptly. When anesthesia below the costal margin is sought an angle of from 10 to 15 degrees is usually sufficient. To obtain anesthesia of the perineum or extremities, the operating table should be tilted immediately at an angle of approximately 10 degrees for from 5 to 10 seconds. Failure to tilt the table immediately after the injection may result in uneven anesthesia and incomplete muscular relaxation. The dosage depends upon the intensity and extent of anesthesia desired. For upper-abdominal surgery, from 12 to 15 mgm. of nupercaine yield satisfactory sensory and motor anesthesia. For anesthesia below

the costal margin, from 7 to 10 mgm. are ample; for surgery of the extremities, from 2.5 to 5 mgm. are sufficient. In the upper age groups the lower limits of dose ranges should be employed. Ten or fifteen minutes should be allowed to elapse after the injection of the solution before changes in posture are attempted. Trendelenburg, prone, lithotomy, and other positions may then be employed with safety.

Anesthesia induced by this technique was employed in 800 consecutive surgical procedures of all types. In 9.5 per cent of the cases the anesthesia extended to or beyond the fifth thoracic segment; in 59 per cent of the cases it was established between the twelfth and ninth thoracic segments; in the remainder it was confined to the lumbar and sacral segments. Satisfactory anesthesia was obtained in all but 10 subjects. In these, failure was due to unsatisfactory lumbar puncture. Duration of the anesthesia ranged from two to three hours in 0.8 per cent of the cases, three to four hours in 98 per cent, and four to six hours in 1.2 per cent. The general impression gained was that hypotension was no more severe or prevalent with nupercaine than in spinal anesthesia with other drugs. Vasopressor drugs were effective restoratives in every instance.

The merits of a local anesthetic drug for spinal anesthesia must be based upon potency, systemic toxicity, and local toxicity. Nupercaine is both more toxic and more potent than procaine and similar agents. Potency and toxicity do not necessarily parallel each other. The amount of nupercaine required for the same degree of anesthesia yielded by procaine is considerably less. Therefore, although nupercaine possesses a greater absolute toxicity, its relative toxicity approximates that of procaine.

JOHN L. LINDQUIST, M.D.

Martin, R. C., Livingstone, H., and Wellman, V.: Continuous Spinal Anesthesia; Observations on 1,200 Patients. *Arch. Surg.*, 1945, 50: 130.

Twelve hundred patients were operated upon under continuous spinal anesthesia. The impressions gained from the clinical experience were reported. Procaine hydrochloride was the anesthetic agent used in the entire series. No difference in effectiveness between the procaine crystals and the 10 per cent solution was noted. The management of a continuous spinal anesthesia was described in detail. Preliminary medication was comprised of calcium pentobarbital and morphine administered from one to one and one-half hours before operation. A thorough discussion was made of the technique of the spinal tap and the continuous spinal setup. The underlying principles of spinal anesthesia were carefully observed throughout the procedure.

A complete study including postoperative observations was made on the first 563 consecutive patients.

This type of anesthesia produced excellent muscular relaxations. After surgery, during the first twelve to twenty-four hours the patients were considered in better condition than they were after inhalation anesthesia of second or third-plane depth They had a minimal amount of fluid imbalance resulting from nausea, emesis, and diaphoresis. A high percentage of the cases studied were poor risks. Nausea and emesis were observed in 17 per cent of the patients. The average fall in blood pressure attributable to the anesthetic was 11 mm. of mercury. Four and four-tenths per cent of the patients had postoperative pulmonary complications. Urinary retention occurred in 4 per cent and cystitis in 2 per cent; 2 per cent of the patients complained briefly of postoperative backache and 2.1 per cent of headache. No residual paresis or paresthesia was noted in the series.

The authors believe that the excellent muscular relaxation and prolonged operating time make this type of anesthesia very popular with surgeons.

MARY KARP, M.D.

Pereira, A. D.: Blocking of the Middle Cervical and Stellate Ganglions with Descending Infiltration Anesthesia; Technique, Accidents, and Therapeutic Indications. *Arch. Surg.*, 1945, 50: 152.

War wounds indirectly involving sympathetic nerves have added impetus to various methods of diagnostic and therapeutic interruption of these structures. This article from Portugal is based on the experience with several hundred cases in which the middle cervical, intermediate, and stellate ganglions were blocked for various reasons during the last ten years. It is stated that this investigation was carried out because of various accidents which occurred during the sympathetic block, the prime reason being to find a method by which accidents could be avoided. It was believed that any attempt to bring the point of the injecting needle into direct contact with the ganglia might lead to puncture of the lung or pleura, injury to the vertebral artery, or interference with the brachial plexus.

The various methods of injecting the upper thoracic and cervical sympathetic ganglia are described in detail, including those no longer in use. Studies were made, by dissection, of the relations of these structures with reference to the fascial planes. On the basis of the anatomical studies a new technique is described, which, according to the author, has obviated the complications of other methods. The blocking of these structures was accomplished with a local anesthetic.

The method is described as a descending infiltration anesthesia in front of the prevertebral aponeurosis with 1 per cent procaine. With the patient in the sitting position, the transverse process of the sixth cervical process is identified, and the needle is introduced almost perpendicularly to the base of this structure at the point where the middle cervical ganglion lies on it. Five cubic centimeters of the solution are injected against the bone and behind the aponeurosis. The needle is then withdrawn 2 or 3 mm., to be out of the resistant prevertebral aponeurosis, in which position from 15 to 20 c.c. of the

solution are injected. The solution blocks the middle, inferior, and stellate ganglions by its descent in front of the aponeurosis and diffuses downward in the soft cellular tissue. If this fails to produce a Horner's syndrome, a second similar injection is made, directed to the base of the seventh cervical transverse process.

The various therapeutic and diagnostic indications for the procedure are described. The various phases of the study are given in considerable detail.

ADRIEN VERBRUGGHEN, M.D.

Whitacre, R. J., and Fisher, A. J.: Clinical Observations on the Use of Curare in Anesthesia. *Anesthesiology*, 1945, 6: 124.

Curare has not replaced the ordinary method of producing relaxation for routine intra-abdominal surgical procedures. However, it has been used conservatively as a method of improving relaxation. It shows special advantage when combined with cyclopropane, as very little circulatory depression results even in poor-risk patients. Fewer complications occur when small divided doses of the drug are used and its total quantity is limited to between 100 and 150 mgm.

In the presence of deep ether anesthesia it was noted that even small doses of curare cause severe circulatory reactions. Therefore it is necessary to exercise considerable caution when curare and ether are used together.

When sufficient curare is given to paralyze the muscles of the larynx, aspiration of foreign material into the lungs may occur unless definite precautions, such as the use of the endotracheal tube, are taken. Prolonged paralysis of the muscles of respiration and muscular spasms frequently occur with large doses of curare. This may lead to hypoxia or to the accumulation of tenacious mucus in the mouth and larynx.

Analgesia was not obtained with curare alone. However, large doses would produce complete relaxation of the skeletal muscles and unconsciousness. A detailed report of several cases was made in which analgesia was attempted by means of the intravenous administration of curare. Muscular twitching and spasms were observed during the recovery period following large doses.

The introduction of the drug into anesthesiology is considered a step forward in the specialty, but further study is necessary to clearly outline the scope of usefulness and the limitations of this drug.

MARY KARP, M.D.

Martin, S. J., and Schwab, J. M.: Blast Injuries and Their Anesthetic Management. *Anesthesiology*, 1945, 6: 131.

The subject of blast injuries is considered important and timely for the civilian anesthetists as well as those in the armed forces. Injuries to the body resulting from detonation of high explosive charges in bombs, depth charges, and torpedoes are known as blast injuries. An extensive review is presented of the academic considerations of air blast and hydraulic concussion injuries, of the clinical evaluation of their symptomatology, and of a proposed anesthetic management of such cases undergoing operation.

Following a blast the sudden release of pressure compresses the immediately surrounding air to form the "pressure component" which may have a pressure as high as 200 atmospheres; behind this there develops a secondary compensatory wave of rarefaction or "the suction component," which may attain a pressure as high as 15 lb. per square inch.

The mechanism of blast injuries most widely accepted proposes that the lesions follow the traumatic effect of the blast wave upon the chest. The pressure wave of the blast produces a sudden elevation of the atmospheric pressure which both hinders expulsion of the air through the trachea and forcibly compresses the thoracic cage and the abdomen. As a result the pulmonary structures are ruptured and hemorrhage occurs from the surrounding torn vessels.

Experimental work on animals has shown that: Fatal effects of primary blast occur only in animals relatively near to the explosion. Fall of the blood pressure occurs proportionately to the intensity of the pressure wave, the initial fall being the result of traumatic shock while the sustained fall is the result of an increase in the intrapulmonary blood pressure. Immediate death is due to shock, internal injury, and occlusion of the airways by blood clot. Delayed death is caused by pulmonary edema and occasionally by intraperitoneal hemorrhages. Ruptures of the ear drum often occur and abdominal lesions are found in about 40 per cent of the cases.

The symptoms most commonly experienced are shock, restlessness, dyspnea, chest and abdominal pain, cough, expectoration, hemoptysis, and leg and trunk tenderness. Pulmonary bleeding continues for forty-eight hours and unless complications arise symptoms usually subside after ten days. The most frequently noted symptoms referable to the central nervous system are temporary unconsciousness and later intense headache, dizziness, and lethargy. Sudden death is due to hydrostatic changes in the cerebral circulation secondary to sudden compression of the thoracic cage. The characteristic pathology consists of bilateral pulmonary hemorrhages. Microscopically, congestion of the alveolar capillaries is most frequently found. The immediate prognosis depends upon the extent of the injuries. If the central nervous system is extensively involved, death is usually immediate. Death may be due to shock, asphyxia, or, later, to secondary invasion of devitalized lung tissue.

The use of bomb shelters whenever possible, heavy clothing, and cotton or plastic ear appliances are prophylactic measures. In the presence of an impending blast one should exhale forcibly and attempt to protect the most vulnerable parts of the body such as the chest and abdomen.

Immediate therapeutics include the treatment of shock and hypoxia by plasma or whole blood and oxygen. Adequate morphine, heat, and the Trendelenburg position are recommended when dyspnea is

not present. Surgery is permissible only when urgently indicated.

Another type of blast injury that is produced by underwater explosions is thoroughly discussed. The mechanism is similar to that produced in air blast but the pathology consists of hemorrhagic lesions in the intestinal tract and lungs, and sometimes perforation of the bowel. The signs of hydraulic abdominal concussion include shock, dehydration, abdominal pain, melena, hematemesis, chest pain, hemoptysis, dyspnea, pyrexia, and perhaps cyanosis. Unless the signs of an acute abdominal condition are indisputable, operation should be withheld as nearly all of these patients recover without operation and they withstand anesthesia and operation very poorly.

When anesthesia is necessary it is important to have an anesthetist who possesses a thorough knowledge of the basic principles and who is well acquainted with the pathology involved in the patient. Premedication is usually morphine with scopolamine or atropine for general anesthesia, with the addition of a barbiturate for regional anesthesia. Care must be used to reduce the dosage of opiate in the shock patient.

Regional anesthesia in one of its many forms should be employed, if possible, in preference to general anesthesia. Its advantages are its minimal interference in the respiratory and cardiovascular systems. Trigeminal-nerve block, brachial-plexus block, and intercostal or paravertebral blocks are used with very little complications. Spinal anesthesia to nerves below the twelfth thoracic segment may be safe for operations on the lower extremity even in patients in shock, and can be used in any operation below the diaphragm when shock is not present and there is no other contraindication.

Epidural block is not considered popular. When general anesthesia is indicated a closed system, the endotracheal cyclopropane method, is regarded as the best. Sodium-pentothal intravenous anesthesia is regarded by some as ideal when given by a competent anesthetist.

It is firmly believed that only by appreciating the physiology and pathology of blast injury can the military or civilian anesthetist provide safe and satisfactory anesthetic management.

MARY KARP, M.D.

SURGICAL INSTRUMENTS AND APPARATUS

Rhinelander, F. W., and Ropes, M. W.: Adjustable Casts in the Treatment of Joint Deformities. *J. Bone Surg.*, 1945, 27: 311.

The value of supporting plaster casts for the prevention and correction of deformities in joint disease, particularly rheumatoid arthritis, is well recognized. Support of an involved joint, which is kept flexed by muscle spasm, permits the spasm to subside and allows the flexion deformity to diminish.

As soon as the flexion deformity had decreased by 10 degrees or so, a formerly used bivalved cast was changed, which permitted further relaxation of the joint. For the past two and one-half years bivalved casts have been made adjustable by the application of hinges. Much time, material, and labor are saved and compensation for variations in the amount of flexion deformity can be more accurately achieved by a mechanized adjustment. Several photographs in this article demonstrate the various adjustable casts employed. One pair of hinges is used repeatedly on successive patients. The manner of making the hinges and fastening them is all described in detail.

The importance of daily exercise of the joints without weight bearing cannot be too strongly stressed. Adjustable casts exhibit their chief value for knees and elbows, but they are also useful occasionally at other sites.

EMIL C. ROBITSHEK, M.D.

PHYSICOCHEMICAL METHODS IN SURGERY

ROENTGENOLOGY

Soule, A. B., Gross, S. W., and Irving, J. G.: Myelography by the Use of Pantopaque in the Diagnosis of Herniations of the Intervertebral Discs. *Am. J. Roentg.*, 1945, 53: 319.

Although considerable progress had been made during the past ten years in the diagnosis of lesions of the intervertebral discs, the role of myelography continued to remain controversial. The reasons for this were several, such as the alleged irritation of the substances employed, the difficulty of the technique of injection, the lack of co-ordination in interpreting the findings, and the inability to remove completely from the subarachnoid or epidural space the injected opaque medium which then for years acted as a foreign body.

The present article deals with the authors' experience in a series of 129 myelographic examinations performed at the Halloran General Hospital, Staten Island, New York, in which a new opaque medium, pantopaque, was used. Seventy-seven patients in this group were operated upon, so that an objective confirmation of the clinical and roentgen findings was possible.

The technique of the lumbar and cervical myelography is described in detail, and several photographs are used to illustrate the correct positioning of the patient.

An analysis of the results shows that in the cases with positive findings the myelograms were correctly interpreted in all but 2: in one case an extradural metastatic-carcinoma was diagnosed as a herniated disc, and in the other a herniated disc was thought to be a spinal-cord tumor. In 64 of the 77 patients the site or sites of the lesions were diagnosed accurately; in each of the additional 8 cases, the major herniation was identified but slight accessory defects noted on the myelograms were not found at operation. In the 5 remaining cases, fine points of interpretation were necessary.

The authors differentiate between various types of defects, such as block, gap, veil, hourglass, lateral pressure, and root types of defects. They use numerous roentgenograms to illustrate the significance of these defects. They also include examples of multiple and of recurrent herniations, and discuss separately the herniations of cervical intervertebral discs.

In comparing pantopaque with other contrast media, several advantages of the former are noted. Pantopaque, a mixture of ethyl esters of isomeric iodophenylundecylic acids, is an oil type of fluid, colorless or pale yellow, with a specific gravity of 1.263 at 20° C., a content of 30.5 per cent of iodine (as compared to one of 40 per cent in lipiodol), and a viscosity which is one-seventeenth that of lipiodol at 37.5° C. Because of these characteristics, it is injected and withdrawn with ease; it moves up and down the canal more rapidly than lipiodol; when repooled, it flows together more completely than lipiodol; it enters readily into sheaths of the nerve roots; it is nontoxic and nonirritating when left in the spinal canal; and it is absorbed from the subarachnoid space at the rate of about 1 c.c. per year. In 41 per cent of the authors' series of cases all of the pantopaque was removed at the completion of the myelographic examination; in 45 per cent of the cases 95 per cent or more was removed; in 12 per cent, from 30 to 95 per cent was removed; and in 2 per cent none was removed. No ill effects were observed in any of the cases.

The conclusion is reached that pantopaque myelography should precede exploration in nearly every case for the following reasons: (1) it offers objective evidence as to the presence of a lesion, although the negative findings should be considered with some caution; (2) it localizes the site or sites of lesions; (3) the procedure is simple, safe, and painless; (4) if pantopaque is left behind, it is nontoxic, nonirritating, and absorbs slowly; and (5) while the operation for removal of a herniated disc is not formidable, positive myelography helps to establish more precise operative indications.

Pantopaque myelography occupies much the same place in the diagnosis of spinal lesions that pneumencephalography occupies in the study of cerebral disorders.

T. Leucutia, M.D.

Rest, A.: The Importance of Examination of the Sputum in Evaluating Parenchymal Infiltration. *Am. J. Roentg.*, 1945, 53: 370.

Eighteen cases are presented which had roentgen changes simulating pulmonary tuberculosis, and of these roentgen changes 1 was classified as minimal, 5 as moderately advanced, and 12 as far advanced, prior to admission to the author's sanitorium. The roentgen findings were diverse and ranged from minimal to extensive lung changes. Only 1 case was asymptomatic, while all the others had symptoms that varied from marked dyspnea and fatigue to severe productive cough, subfebrile temperature, loss of weight, and hemoptysis. However, none of them ever had sputum positive for tubercle bacilli.

Subsequent examinations revealed that 4 patients had primary carcinoma of the lung, 2 had Boeck's sarcoid, 2 had sarcoma of the mediastinum, 3 had nontuberculous bronchiectasis, while the others had aleucemic lymphatic leucemia with lung changes, Hodgkin's disease, mitral stenosis and insufficiency, calcinosis of the lungs, and Ayerza's disease, respectively.

It should be kept in mind that certain nontuberculous pulmonary conditions may produce roentgen changes in the lungs that are indistinguishable from those produced by tuberculosis. These nontubercu-

lous lung conditions may even produce clinical symptoms that simulate very closely, if not exactly, the symptoms produced by tuberculosis.

The absolute diagnostic feature is the demonstration of the tubercle bacillus in the sputum. When a patient expectorates sputum from below the bifurcation of the trachea, the sputum contains tubercle bacilli if an open lesion of tuberculosis exists. If the sputum has always been negative, search should be made for a nontuberculous pulmonary condition, even if the roentgen changes suggest tuberculosis.

The roentgenologist's diagnosis of the chest roentgenogram for tuberculosis should be presumptive rather than absolute, unless the clinical data reveal that the sputum is positive for tubercle bacilli.

Adenocarcinoma of the lung is relatively slow growing and in the early stages may produce very slight pulmonary symptoms; it may easily be mistaken for inactive or mildly active pulmonary tuberculosis. The presence of a parenchymal lesion in individuals in the fifth or sixth decade who have persistently negative sputum examinations should lead to the investigation for carcinoma, the glandular form of which is apparently responsive to early radical surgery. JOSEPH K. NARAT, M.D.

Behrens, C. F.: Some Roentgenological Considerations Pertaining to Upper Extremity Pain. *J. Am. M. Ass.*, 1945, 127: 888.

Pain, disability, and abnormal sensation in the upper extremity may be due to trauma (contusion, sprain, fracture, dislocation), or acute infection, rheumatic fever, or "bursitis." Calcification in the region of the supraspinatus tendon may cause unusually severe pain and disability.

Patients with negative shoulder roentgenograms are an enigma to the physician. In such instances, pathology in the region of the cervical spine should always be considered and eliminated as a differential possibility. A common finding is thinning of the intervertebral discs and degenerative hypertrophic arthritic changes in the vertebra. This is frequently overlooked in considering the cause of shoulder pain. Pain is caused by pressure on the nerve root in the region of the intervertebral foramen. Arthritic changes on the anterior body of the vertebra do not produce pain.

The best therapy for shoulder pain is the conventional massage, manual traction, and manipulation. Diathermy tends to aggravate the condition. Roentgen therapy has produced excellent results in "bursitis." The relief of symptoms is actually due to the action of the x-rays on the inflammation and not on the calcium. The results of irradiation therapy of patients with cervical arthritis have been favorable in those instances in which a surrounding inflammation was present. The reduction of edema and passive congestion in the intervertebral-foramen areas reduces pressure on the nerve roots and thereby reduces the pain. In hypertensive patients, a drop in the blood pressure is frequently seen; this is caused by irradiation of the carotid ganglion.

The author uses from 75 to 100 roentgens (200 kv.p., 0.5 mm. of copper plus 3 mm. of aluminum; 60 cm. distance) twice weekly at first, then once weekly for from six to eight treatments. A second course of therapy is repeated in from six to eight weeks. Caution should be observed not to undertreat or overtreat these patients. If a lesion is radioresistant, then x-ray therapy should be discontinued. Irradiation therapy has also been efficacious in the treatment of herpes zoster. MAURICE D. SACHS, M.D.

Kasabach, H. H., and Donlan, C. P.: Roentgentherapy of Hemangioma of the Larynx in Infants. *J. Pediat.*, St. Louis, 1945, 26: 374.

Hemangioma of the larynx in infants is a very rare condition.

The authors report 2 cases in which roentgen therapy produced very satisfactory results. The infants were three months and five and one-half months old, respectively. In both, emergency tracheotomy had to be performed prior to the institution of any treatment. A tumor dose of 1,200 roentgens given in less than three weeks with 200 kv. proved adequate.

The authors also collected 10 cases from the literature. These are tabularly presented by considering the most important factors such as, sex of the patient, age, outstanding symptoms, remissions, location of the tumor, method of diagnosis, treatment, end-result, and associated pathological conditions.

The following facts are established:

Hemangioma of the larynx in infants is congenital. It occurs most commonly in the males, although the 2 cases of the authors' were in females. The symptoms, in order of frequency, are obstructive dyspnea, inspiratory stridor, a hoarse cry, croupy cough, blood-tinged mucus, gross hemorrhage, and fever if there are pulmonary complications. There may be one or more periods of remission due to changes in blood volume of the tumor. The majority of the lesions are located in the subglottis region. The diagnosis is based on the history and a laryngoscopic finding of a red or bluish subglottic mass. In the presence of stridor one must rule out other possible causes, such as a small glottic lumen, congenital web below the glottis, macroglossia, laryngeal papilloma, cyst, enlarged thymus, mediastinal tumor, and foreign body. If complicated by fever, perilaryngeal abscess and acute infections must also be eliminated.

The treatment consists of low tracheotomy to relieve obstructive dyspnea and radiation therapy as soon as possible. Because of the simplicity and accuracy of application the authors recommend roentgen therapy, with the technique specified above, as the method of choice. Should irradiation fail, surgical removal, preferably by thyrotomy, must be considered. T. LEUCUTIA, M.D.

Pohle, E. A., Paul, L. W., and Clark, E. A.: Roentgen Therapy of Boeck's Sarcoid. *Am. J. M. Sc.*, 1945, 209: 503.

The basic lesion of Boeck's sarcoid is the epithelioid cell tubercle with occasional giant cells of the

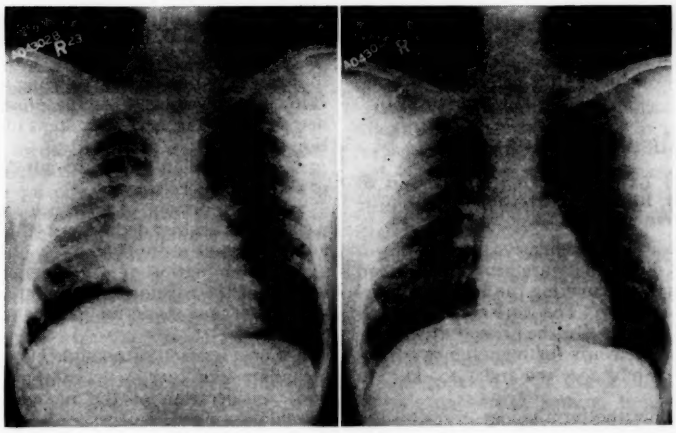

Fig. 1. Left, Soft thickening of the hilum shadows bilaterally, more pronounced on the right with soft infiltrative extension out into the mid- and basal lung fields (April 15, 1942). Right, Clearing of the hilar thickening and of the soft opacity below the right hilum (July 17, 1942).

Langhans type in the absence of caseation. Very rarely there is some central necrosis. Because of these characteristics, the pathologists often classify the disease as hyperplastic or noncaseous tuberculosis.

Clinically, the condition most frequently occurs in the mediastinal lymph nodes and the pulmonary tissues, although practically every organ or system of the body may form its site of involvement. Often the intrathoracic manifestations exist without physical signs and without any further extension of the disease. In such instances, roentgen examination of the chest plays the most important role in the diagnosis. The findings, as a rule, reflect the degree of enlargement of the mediastinal lymph nodes and the extent of associated invasion of the pulmonary structures. The enlarged lymph nodes produce soft, lobulated shadows in the hila or along the upper mediastinum, occasionally forming broad masses overlying the heart and great vessels. When the lungs are involved, the lesions appear in various forms, such as widely distributed coarse, patchy densities; irregular striations; fibrous bands; and even uniformly distributed miliary nodules. A distinguishing feature is the disproportionate mildness of the clinical symptoms. Because of this benign nature of the disease and since a spontaneous recovery not infrequently occurs after a period of several years, it may never be possible to obtain a biopsy for microscopic confirmation and thus the diagnosis often must remain presumptive.

There is no established treatment for Boeck's sarcoid. The literature on the value of roentgen irradiation is meager and no definite conclusion can be drawn. The authors recently sent questionnaires to 33 radiologists of this country and Canada in an attempt to obtain some information as to the present status of roentgen therapy in Boeck's sarcoid. Thirty-one replies were received but the answers failed to throw additional light on the subject. Most of the radiologists approached have had no experience, others advised against roentgen therapy, and only a very few claimed to have observed definite improvement.

During the past two years the authors treated 14 cases of Boeck's sarcoid in the Department of Radiology at the State of Wisconsin General Hospital. Attention was paid chiefly to the intrathoracic lesions. The method of treatment has been 6 exposures of 150 roentgens (in air) to the anterior and posterior mediastinum (15 by 20 cm.), one area daily, with 175 kv., HVL = 1.0 mm. of copper. A second series of similar treatment was given from six to eight weeks later, and, if necessary, a third series was given two months after the second. Other glands involved received 3 x 150 roentgens (in air), daily or every other day, the series again being repeated once or twice at from four- to six-week intervals.

Eight of the cases treated have been followed up. In 6 there was definite evidence of roentgenological improvement within from two to four months after therapy was started, whereas the clinical improvement started somewhat earlier. In 1 case the improvement was noted five months after treatment; the eighth patient failed to return.

These 8 cases are individually presented in brief resumes and the results illustrated with roentgenograms made prior to the treatment and at various intervals after treatment (Fig. 1).

The preliminary conclusions are reached that since the results were favorable in the majority of the

cases and no untoward effects were observed, the use of roentgen rays in the treatment of Boeck's sarcoid is to be encouraged in order to arrive at a definite opinion regarding its true efficacy.

T. LEUCUTIA, M.D.

MISCELLANEOUS

Packard, C., and Exner, F. M.: Comparison of Physical and Biological Methods of Depth-Dose Measurement. *Radiology*, 1945, 44: 357.

The authors made a comprehensive series of physical and biological dosage measurements of roentgen rays of various qualities covering the entire range as currently used in therapy. The work was started in 1932 and finished in 1942. In the present article the results of the measurements for roentgen rays produced at approximately 200, 500 and 1,000 kv. are published.

The authors follow the terminology given in the glossary of Technical Bulletin No. 1 of the Radiological Society of North America. They use the symbol "D" for free air dose or intensity, "D_o" for surface dose or intensity (at depth of 0 cm.), "D_n" for depth dose or intensity (at depth of n cm.), and "D_e" for exit dose or intensity. All dosage ratios are expressed as percentages in conformity with established usage in the case of "percentage depth dose." In addition to the familiar "D_n/D_o," the ratios of "D_o/D" and "D_n/D" are also stated.

The physical measurements were carried out with the Victoreen condenser dosimeter and a "25-roentgen" chamber. To assure electron equilibrium, caps of organic material up to 2 mm. in thickness were placed over the chamber during all free air and surface measurements which were made at voltages above 300 kv.

The biological measurements were made by using the eggs of the drosophila as the test object. It was found that a dose of 190 roentgens killed, on the average, half of the eggs in a sample, if a constant temperature of between 20° and 22° C. was maintained throughout the experiments. Some of the precautions which must be observed are described in the text. In all, 500 separate experiments involving the exposure of more than one-half million eggs were made.

In comparing the physical and biological measurements, the authors took into consideration the wave length and geometrical effects. The technique of phantom measurement likewise necessitated several specific adjustments. These are described in the text.

The results are presented in the form of tables and plotted curves. It was found that the difference between D_o/D and D_n/D_o ratios obtained by the two methods were small and within the limits of experimental error.

The conclusion is reached that the biological and physical methods of measurement of phantom ratios give results which are in complete agreement.

T. LEUCUTIA, M.D.

Exner, F. M., and Packard, C.: Measurements of Surface- and Depth-Dose Ratios from 70 to 1,000 Kv. *Radiology*, 1945, 44: 367.

When radiation therapy is being administered, the skin and underlying tissue dose must be accurately determined. The necessary steps for this determination are:

1. Measurement of the free air dose at the center of the field on the skin
2. Determination of entrance and exit doses as well as any desired depth dose (this includes proper addition for crossfire fields)
3. Determination of width penumbra inside and outside of the edge of the geometrical field
4. Allowance made for gas, bone, and fat in exposed area
5. Consideration of possible effects of incomplete secondary equilibrium, when supervoltage is used; and consideration of the biological effect of the thimble chamber

A comprehensive study of dosage ratios on the basis of the above criteria was carried out. For this purpose, some new charts were devised. These are explained in detail in order that use may be made of the charts without reference to the entire article.

A Sloan generator is described. This generator can operate at any desired voltage from 70 to 1,000 kv. Off-focus and secondary irradiation inside the vacuum chamber were minimized. "Cold emission x-rays" were negligible. A 25 and 100 roentgen Victoreen ionization chamber was used. Water was used as the phantom material.

As far as possible, the conditions were such that the experiments concerning the surface and depth dose measurements could be reproduced by any investigator. The "geometric characteristics of the beam" (penumbra, off-focus radiation, divergence index, lateral-intensity distribution, diaphragm transmission) and "wave-length composition of the beams" (half-value layer, homogeneity coefficient in water, characteristic radiation) are discussed.

As a result of a series of experiments in which the beam quality at various voltages was determined, the authors set up simplified charts with which the intensities for given half-value layers, field size, and focal skin distance are obtainable. These charts and a summarized instruction sheet are available for use at a minimal cost.

MAURICE D. SACHS, M.D.

Meredith, W. J., and Stephenson, S. K.: The Use of Roentgenographs for Dosage Control in Interstitial Gamma-Ray Therapy. *Brit. J. Radiol.*, 1945, 18: 86.

At the Christie Hospital and Holt Radium Institute of Manchester, England, the well known Paterson-Parker system is used for dosage control in interstitial radium therapy. This system has been evolved for planar and volume implantation covering a large variety of possible clinical applications.

Experience shows, however, that the taking of roentgenographs is desirable to further improve the accuracy of the method by visualizing the distribu-

tion of the implants and by checking the measurements made clinically.

In the present article the authors describe in lengthy detail the roentgenographic procedure, and they use several clinical situations to illustrate its value.

As a rule the roentgenographs are taken immediately after implantation while the patient is still anesthetized. Two exposures are made in mutually perpendicular directions in a manner similar to that practiced in the localization of foreign bodies. In order to minimize magnification and distortion, the film-focus distance should be long (36 inches), while the implant film distance should be minimal. The exposure should be as short as possible under the circumstances to obviate "fog" from the gamma rays. In some cases oblique or special views are also required, as, for example, verticomental or submental views.

In order to obtain the actual dimensions of an implantation from roentgenograph measurements it is desirable to use some known field points or objects as guides. The authors describe four methods:

1. The geometric method, in which the idea of the order of magnification is obtained from a knowledge of the target film and implant film distance.

2. The direct needle method, in which the needles themselves act as gauges. A needle shown by one film to lie in a plane parallel to the plane of the other film will give a true magnification factor for the second film if its length on that film is divided by its true length.

3. The ring method, in which a brass ring about 5 cm. in diameter is fixed on to the patient's skin so as to be as nearly as possible at the same distance as the implant from each film.

4. The indirect needle method, in which a crossing needle is used as a gauge.

The first method is rather inaccurate and, therefore, seldom used; the second is better. The third method is especially valuable in cases of implantation of radon seed when the sources are short and/or of unknown length. The fourth method has most frequent application in regular single-plane implantations.

The examples chosen by the authors for the illustration of various clinical situations include (1) single planes of needles; (2) single planes of radon seeds; (3) two or more planes of needles; and (4) cylindrical volumes, as for example the implantation of axilla.

The conclusion is drawn that the roentgenographic control of radium implantations has advantages other than providing a method of dosage calculation. These may be immediate or of long-term. The immediate advantages are the ability to visualize and correct faulty distribution of the implants. If there is crowding of the implants at certain points, some of them may be removed and vice versa. Thus, as a whole a greater homogeneity of the irradiation is assured. The long-term advantages consist in the fact that permanent records are obtained of every radium implantation, and later, on the basis of established clinical results, the faults of a certain technique may be corrected. In this manner it is possible to formulate new distribution rules if clinically a certain type of treatment appears more desirable. T. LEUCUTIA, M.D.

MISCELLANEOUS

DUCTLESS GLANDS

Curtis, G. M., and Fertman, M. B.: Blood-Iodine Studies. An Analysis of the Blood Iodine in Thyroid Disease. *Arch. Surg.*, 1945, 50: 207.

The authors state that the principal consideration in this series of studies is the relation of the blood-iodine level to the basal metabolic rate in various physiological and pathological states. The essential composition and the exact relation which the blood iodine bears to the thyroid hormone is unknown.

The determination of blood-iodine values by the authors was made first by the dry-ash technique and later by the chromium-trioxide method. The blood iodine, and specifically its protein-bound fraction, is an index of the circulating thyroid hormone and is regulated essentially by the functional activity of the thyroid gland. The behavior of the blood iodine may prove to be of diagnostic significance when it is difficult to obtain a reliable determination of the basal metabolic rate and, also, in the differentiation of hyperthyroidism from other simulating conditions in which the basal metabolic rate is also elevated. It is of value in distinguishing goiter with hyperthyroidism clinically from goiter without hyperthyroidism in which the basal metabolic rate may be otherwise increased.

Perkin and Cattell state that the amount of iodine in the blood may be a more reliable criterion than the basal metabolic rate in the differential diagnosis of borderline hyperthyroidism. Perkin and Hurxthal concluded that estimations of the blood-iodine level taken at stated intervals offer a means whereby predisposition to recurrence or persistence of clinical hyperthyroidism can be predicted. The level of the blood iodine may be used as an index for determining the correct amount of thyroid tissue to remove. The authors note that the blood iodine appears to be a more specific measure of thyroid overactivity than the serum cholesterol. The blood-iodine determination may prove of value for patients with ovarian struma, with total intrathoracic goiter, or with other aberrant thyroid tissue.

The average blood-iodine level was found to be significantly elevated in all forms of toxic goiter, and variations in the individual blood-iodine values were likewise found to exceed those of normal persons. Associated with the increase in the blood iodine there was an elevated average basal metabolic rate.

In no two groups of toxic goiter, including the exophthalmic variety, was there found by statistical test any significant difference between the average blood-iodine concentrations. However, some difference in the nature or quantity of the whole or fractionated blood iodine might be expected in exophthalmic goiter and should be further investigated. It was noted that the blood iodine may rise as high in toxic nodular goiter as in exophthalmic goiter.

On the other hand, the average blood-iodine level was not significantly elevated in nontoxic nodular goiter and in nontoxic diffuse colloid goiter. The average basal metabolic rate was significantly increased in nontoxic nodular goiter but averaged only −7 per cent in diffuse nontoxic colloid goiter.

The average blood iodine in 79 patients with hypothyroidism was not significantly lower than that in normal persons from the Great Lakes region, although the average basal metabolic rate was definitely reduced. The value of the average blood iodine may have been influenced by previous iodine medication in certain instances, of which, however, there was no record. The importance of fractionation of the blood iodine, especially for such patients, is emphasized.

The average blood iodine in 9 patients with carcinoma of the thyroid, unlike that of a previous group of 3 similar patients, did not differ significantly from the normal, in spite of an elevated basal metabolic rate. There was no significant correlation between the blood-iodine level and the duration of the symptoms due to the carcinoma or to those of goiter when such was recorded. The level of the blood iodine in carcinoma of the thyroid is more dependent on the nature of the thyroid gland in which the malignant growth occurs than on the malignant growth itself.

In none of the thyroid disorders investigated was there found any significant linear correlation between the level of the blood iodine and the duration of symptoms or of goiter. However, that some association may exist was indicated by a significant positive multiple correlation coefficient of the blood iodine in relation to the basal metabolic rate and the duration of toxic symptoms in hyperthyroidism, or of goiter in nontoxic nodular goiter. This relationship shows that the blood iodine increases rather than decreases with some combination of the other two factors.

In 3 patients with chronic thyroiditis, the average blood iodine was not significantly elevated.

HERBERT F. THURSTON, M.D.

Viets, H. R.: Myasthenia Gravis. *J. Am. M. Ass.*, 1945, 127: 1089.

The present article attempts to evaluate the author's knowledge based on nine years of experience, in which he observed 125 cases of myasthenia gravis at the Massachusetts General Hospital, Boston, and gives a summary of the investigations undertaken, the results found, and a review of the most important literature. A separate outpatient clinic was established in 1935 and about 60 cases are being followed constantly.

Neostigmine was first resorted to in March, 1935 and has continued to be the principal drug used in the treatment of myasthenia gravis. Neostigmine is useful also as a means of diagnosis—the study of the swallowing reflex before and after neostigmine injection leads to the most reliable diagnosis.

In treatment the average intake of 45 ambulatory patients seen during 1943 and 1944 was 10.9 tablets of neostigmine bromide (15 mgm. each), spaced during the twenty-four hours, or a total of 163.5 mgm. However, some patients were maintained on a minimal amount dosage; in a few cases as little as 15 mgm. divided in 2 doses which were taken by mouth were sufficient to relieve mild symptoms. Nevertheless, general weakness or more specific symptoms, such as ptosis, diplopia, dysarthria, or dysphagia, usually required larger amounts. The highest dosage was 25 tablets a day for a patient who has been maintained on this intake for a number of years. A report of this case is given.

A special chart, based on that used by Schwab and Skogland, is used by the patient to record his symptoms and assists the physician in the outpatient department in determining the amount and spacing of the future dosages of the drug. However, when the patient is more seriously ill than the average in an ambulatory clinic, neostigmine is given in the form of neostigmine methylsulfate by subcutaneous or intramuscular injection—this preparation may also be used intravenously and given instead of the orally administered neostigmine bromide. The patient must be instructed how to administer the dosage to himself in an emergency, such as respiratory embarrassment due to weakness of the diaphragm and chest muscles. Under ordinary circumstances 0.5 mgm. of neostigmine methylsulfate equals 15 mgm. of neostigmine bromide taken by mouth. Atropine is usually added to prevent the muscarinelike action on the smooth muscles and ordinarily 0.6 mgm. is sufficient for this purpose

Other drugs used in myasthenia gravis are ephedrine sulfate, potassium chloride, and guanidine hydrochloride; however, none of these has more than from 10 to 15 per cent of the effectiveness of neostigmine, and due to their various shortcomings few of the patients at present care to use them.

Among the 15 patients subjected to thymectomy in the last four years, there were 4 operative deaths (26.6 per cent). Thymomas were found in 4, hyperplasia of the thymus in 3, and the thymus gland appeared to be normal in the remaining 8 patients. Of these cases, 2 are considered at the present time as in complete remission, 2 more are distinctly improved, 3 are moderately improved, 1 is slightly improved, and 3 have been operated on too recently to be evaluated. The case histories, together with photographs of the removed gross and microscopic specimens, are appended and show that the degree of improvement ascribable to the operation does not exhibit any relationship to the presence of hyperplasia, or even of a thymoma. As a consequence the author is not in a position, as suggested by some, to advocate thymectomy in every case of myasthenia gravis. Particularly patients in the older age groups (over fifty years of age) should not in most instances be treated by thymectomy.

At the present time we are still in the experimental stage, with slight but definite indications, however, that there is some relation between the thymus and myasthenia gravis. JOHN W. BRENNAN, M.D.

SURGICAL PATHOLOGY AND DIAGNOSIS

Hollender, A. R., and Szanto, P. B.: Lymphoid Hyperplasia of the Nasopharynx; A Study of 131 Autopsy Specimens. *Arch. Otolar.*, Chic., 1945, 41: 291.

The distribution of lymphoid tissue in Waldeyer's ring was studied in 131 autopsy specimens. The commonly accepted concept that developmental and involutional changes in the lymphoid tissue comprising Waldeyer's ring follow a craniocaudal sequence, was not entirely borne out. The nasopharyngeal and tubal tonsils developed earliest. Involution was the rule during adulthood up to the age of seventy-five years and more. Of the 21 latter cases 3 showed hyperplasia of the nasopharyngeal tonsil, the tubal tonsil showing more constant involutionary changes in later years. The question is raised as to whether such lymphoid hyperplasia is a factor in the impairment of hearing in older persons. No correlation was found between the stage of development of the nasopharyngeal tonsil and other pathological processes in the body. JOHN R. LINDSAY, M.D.

Rottino, A., and Willson, K.: Osseous, Cartilaginous, and Mixed Tumors of the Human Breast; A Review of the Literature. *Arch. Surg.* 1945, 50: 184.

Rottino and Willson surveyed the literature pertaining to a group of rare tumors of the breast. Collectively the growths are characterized by the presence of bone, cartilage, fibrous tissue, and pleomorphic cells; and according to whether these elements are found alone or in combination, they have been reported as chondromas, osteochondromas, osteoid sarcomas, giant-cell sarcomas, myeloid sarcomas, mixed tumors, osteoclastomas, and teratomas.

Available cases were analyzed, which included 7 enchondromas, 21 chondrosarcomas, 8 osteochondromas, 12 osteochondrosarcomas, 5 osteosarcomas, 5 osteoid sarcomas (giant-cell sarcomas), 5 mixed tumors, and 9 ossifying-chondrifying and giant-cell tumors associated with carcinoma. These cases were tabulated according to the year of their report, age of the patient, onset of the tumor symptoms, treatment, and follow-up history.

All the tumors were considered essentially malignant inasmuch as no matter what form of surgical treatment was employed (excision or radical mastectomy) metastasis usually occurred. It was found that a long-standing fibroadenoma was in many cases the parent growth from which such tumors

arose, and the osteoid and bone elements probably arose by metaplasia from hyalinized collagen. The mode or origin of cartilage, however, was less clear.

The nature of the cellular component evoked divergent opinions—some of the authors stated that it was of a carcinomatous, and others that it was of a sarcomatous character. STEPHEN A. ZIEMAN, M.D.

Laipply, T. C.: Cysts and Cystic Tumors of the Mediastinum. *Arch. Path.*, Chic., 1945, 39: 153.

The great variety of mediastinal cysts and cystic tumors may be classified as congenital (8 types) and acquired (3 types). The following classification is offered:

Congenital: (1) epidermoid cyst, (2) dermoid cyst, (3) teratoma, (4) pericardial celomic cyst, (5) bronchial cyst, (6) esophageal cyst, (7) gastroenteric cyst, and (8) cystic lymphangioma.

Acquired: (1) parasitic cyst, caused by the taenia echinococcus, (2) neoplastic cyst, due to degeneration of a solid tumor, and (3) cystic hematoma, resulting from degeneration of a hematoma.

A review of the literature reveals a large number in the congenital group. Additional dermoid, bronchial, and gastric cysts of the mediastinum are reported by the author. With these there are recorded in the literature 245 epidermoids, dermoids, and teratomas, 35 bronchial cysts, 14 gastric cysts, and, at the most, 5 enteric cysts of the mediastinum. Eleven and four-tenths per cent of the epidermoids, dermoids, and teratomas were cancerous. All other types of congenital mediastinal cysts were noncancerous. Such cysts and tumors may give rise to symptoms late in life but the majority reach sufficient size to cause symptoms during the first three decades. The most common symptoms were cough, pain in the chest, dyspnea, and hemoptysis. The treatment of choice is complete surgical excision, if possible, prior to the development of pressure symptoms or infection. JOSEPH K. NARAT, M.D.

Schepers, G. W. H.: The Pathology of Regional Ileitis. *Am. J. Digest. Dis.*, 1945, 12: 97.

A very extensive article is presented in which the current literature on regional ileitis—the nomenclatures, epidemiology, etiology, clinical features, case reports and gross pathological anatomy, gross pathology, micropathology, epithelium, tunica propria, submucosa, muscular coats, adventitia, serosa and mesentery, lymphoid tissue and lymphatics, blood vessels, nervous tissue, cytology, micro-organisms, and inclusion bodies—is thoroughly discussed.

The etiology remains a complete mystery. The epidemiology gives little evidence. Features of the clinical history give little guidance. After radical excision has been carried out and the disease appears at a later stage, one is led to believe that either the etiological factor persists in the patient or that the disease selects certain individuals particularly prone to it, or there is a reappearance of the relatively nonspecific chronic lesions at a later stage. All of the contributions of clinical pathology have been negative. The contributions of microbiology are also negative. It is suggested by the authors that regional ileitis may even represent a visceral form of herpes zoster.

Regional ileitis has a primary phase characterized by a stage of edema. Next, the stage of plasma-cell infiltration is followed by diffuse fibrosis and, finally, healing. A secondary phase is characterized by ulceration superimposed upon any of the primary phases. A critical analysis suggests that the primary stage is due to either acute injury of the bowel wall or a neuropathic disturbance.

RICHARD J. BENNETT, JR., M.D.

EXPERIMENTAL SURGERY

Mulligan, R. M.: Some Endocrinological Considerations of Canine Neoplastic Diseases. *Arch. Path.*, Chic., 1945, 39: 162.

The histological study of a number of canine neoplasms observed at autopsy and in surgical specimens, and some preliminary success in the production of neoplasms in dogs by means of carcinogen, stimulated a review of the available literature on canine oncology in an attempt to assemble pertinent facts to form a basis for future investigation in this field.

Several leads revealed by this review included a syndrome of feminization in male dogs associated with testicular carcinoma, the relation between benign prostatic hypertrophy and castration, the coexistence of changes in the female genital tract with cysts and solid tumors of the ovary, the presence of hyperinsulinism with neoplasms of the pancreatic islets, the problem of the interpretation of proliferation of interstitial cells of the testes, the paucity of neoplasms reported for the pituitary, parathyroid, thymus, and adrenal glands, the possible etiological connection of hormones with venereal sarcoma, and the embryological and hormonological aspects presented by mammary tumors.

JOSEPH K. NARAT, M.D.